Report No. 85:02

A FIVE-YEAR FOLLOW-UP STUDY OF THE NORTH VANCOUVER JANSKY-DE HIRSCH SCREENING BATTERY

GRANT NUMBER: DG 299

AUTHOR(S): Rochelle Watts

PROJECT SITE OR SAMPLE: School District No. 44 (North Vancouver)

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A FIVE-YEAR FOLLOW-UP STUDY
OF THE NORTH VANCOUVER JANSKY-DE HIRSCH SCREENING BATTERY

by

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B.Ed., The University of British Columbia, 1964

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS IN EDUCATION

in

THE FACULTY OF GRADUATE STUDIES

Department of Educational Psychology and Special Education

We accept this thesis as conforming
to the required standard.

Harold C. Ratzlaff

The University of British Columbia

September 1984

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ABSTRACT

Since its publication in 1972, the Jansky-de Hirsch Screening Index has become one of the most widely used early identification batteries in North America. Little research has been completed, however, on the predictive validity of this instrument for identifying at-risk children for reading and spelling difficulties.

North Vancouver School District has used the Jansky-de Hirsch Screening Index for the past ten years. This battery consists of five subtests which take approximately 30 minutes to administer and mark. All North Vancouver students are individually assessed with this instrument in January of their kindergarten year. Children who score poorly on the Screening Index are given a diagnostic assessment and classroom intervention strategies are planned if necessary. Each school's learning assistance teacher is responsible for the screening and diagnostic assessments.

This five-year follow-up study was initiated in 1980. The major purposes of this correlational study were to: 1) assess the predictive validity of the North Vancouver Jansky-de Hirsch screening program; and 2) to collect and analyze data on a number of predictor and criterion variables of interest to North Vancouver educators.

A total of 304 subjects, 155 males and 149 females, took part in the study. These subjects were randomly selected from 756 Grade Five students who had attended a North Vancouver kindergarten in 1975-1976. Twenty-eight of the 31 North Vancouver elementary schools agreed to participate in the research.

Thirty predictor and 43 criterion variables were used for the data analysis. The predictor instruments consisted of the Jansky-de Hirsch Screening Index and its follow-up test, the Diagnostic Battery. Age and sex of student were included as predictor variables. The criterion instruments consisted of the Canadian Tests of Basic Skills (six subtests), the Test of Written Spelling and a student rating scale developed by the researcher. The criterion variables also included background data on the subjects' involvement with school and district special education services.

The major statistical computations used in this study were t-test, correlation and multiple regression analyses. Means and standard deviations were calculated for most variables. The predictive validity of the Jansky-de Hirsch Screening Index was assessed by matching the low-risk and high-risk subjects on the Screening Index total score with the low-risk and high-risk subjects on the criterion test variables. The percentage of correctly and incorrectly classified subjects formed the predictive effectiveness or hit rate of this study.

Data analysis of the variables revealed a number of interesting research findings. Although few sex differences were found on the kindergarten test measures, female subjects achieved significantly higher marks than male subjects on all the criterion test variables. Few significant age differences were observed at the kindergarten or Grade Five level. Pearson correlation coefficients were computed for most of the variables. The relationship between the predictor and criterion test measures tended to be low to moderate and the intercorrelations between the criterion test variables were generally moderate to high.

The predictive effectiveness of the Screening Index total score ranged

from 74.26% to 79.93% on the nine criterion test measures. The percentages of correctly predicted students for the CTBS Vocabulary and Comprehension subtests were 79.93% and 78.62%, respectively. The hit rate for the CTBS and TWS spelling measures was slightly lower with an average of 76.65%. These percentages represented correct reading and spelling classification placement for almost four out of five students in this study.

The multiple regression analyses of the predictor and criterion test variables and sex of student revealed little difference between the amount of variance for the raw score and converted score kindergarten subtests. Letter Naming contributed the highest proportion of variance to the CTBS vocabulary, comprehension and spelling scores. The rank order of the predictor variables changed considerably on many of the regression analyses and the highest computed R square was 0.377 (CTBS Comprehension).

Dr. David Kendall
Thesis Chairperson

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Acknowledgments

I would like to express my appreciation to the following people who helped in the completion of this research study.

To the members of my thesis committee: Dr. David Kendall, the chairperson, for his continuing support and encouragement throughout this study; Dr. Harold Ratzlaff for his generous consultative advice and statistical expertise; and Mr. Ian McEown for his interest in early identification and his high-quality co-ordination of the North Vancouver special education department.

To my husband, Reg, who has always provided love and support throughout all my academic endeavors.

To John Spinelli, the statistician who helped with the computer analyses, and Mrs. Ann Neuman and Mrs. Margaret Ward, the teachers who assisted with the criterion test marking.

To the North Vancouver teachers, students and administrators who helped make this study possible.

Financial support for this research study was provided by the Educational Research Institute of British Columbia and the North Vancouver School District.

CHAPTER ONE

Introduction to the Study

During the past 20 years, there has been a growing awareness of the need for early identification of children with learning difficulties. Many educators and researchers have stressed the importance of early identification of high-risk students so that appropriate program planning could be developed and implemented for these pupils. Children with learning problems often become passive learners with poor self-concepts and little expectation of self-improvement. This interrelationship between academic failure and negative self-esteem has been frequently cited in special education literature (Jansky & de Hirsch, 1972; Lerner, 1981). School districts in the 1980's are attempting to prevent this failure syndrome by early identification of at-risk children before they experience years of frustration and failure. Few educators would disagree with this decision.

Kindergarten screening programs have become widely used in the past two decades as teachers and administrators attempt to distinguish the following two groups of students: (1) low-risk pupils who will probably achieve success with the Grade One reading program; and (2) high-risk pupils who will probably experience difficulty with the Grade One reading program. A large number of kindergarten batteries have been designed to meet this need. Zeitlin (1976) estimated that over 1,000 screening instruments had been developed for the early identification of children with learning difficulties. Although the advantages and disadvantages of kindergarten screening programs have been thoroughly debated, no general agreement has yet been reached on the best type of assessment battery.

A wide variety of early identification instruments are presently available at the kindergarten level. These resources include single variable tests, multiple variable batteries, teacher checklists and student rating scales. Early assessment instruments fulfill three major purposes: (1) screening groups of children to identify students at-risk of academic failure; (2) assessing the strengths and weaknesses of individual pupils; and (3) measuring psychological processes which are thought to underlie the reading process.

Specialists in the field of learning disabilities have spent many years researching the precursors of reading achievement. Areas such as perception, language and intelligence have been thoroughly investigated in the search for the best combination of variables for the prediction of Grade One reading success or failure. A few researchers, notably Satz and his colleagues (1975, 1978, 1979), have used a theoretical model as the foundation for their screening batteries. Most early instruments, however, have not evolved from a theoretical framework but have been designed on the basis of varying degrees of research and bias.

Statement of the Problem

A large number of factors have contributed to the controversy surrounding early identification of children with learning difficulties. The advantages and disadvantages of kindergarten screening have been extensively discussed by teachers and administrators and numerous journal articles have been written on this topic. The issues being debated are complex and closely interrelated with one another. This section will attempt to summarize some of these major areas of concern.

During the past three decades, researchers have tried to establish which precursors are the best predictors for determining a child's success or difficulty with reading. A large number of variables have been widely studied, including auditory and visual perception, oral language, intelligence and visual-motor integration. Each of these areas can be subdivided into a network of interconnected subskills. These subskills are difficult to prioritize in terms of their contribution to beginning reading as reading is a gestalt process not easily divisible into distinct categories. Researchers involved in early identification screening must determine not only the general areas they want assessed in their kindergarten battery but also what specific subskills will be tested in that area. The problem remains a complicated one as experts in the field of learning disabilities have not yet reached any consensus on the most important precursors for learning to read.

The proponents of early identification assessment usually advocate four main advantages of kindergarten screening programs. Many educators believe that a comprehensive screening, diagnostic and intervention program can prevent some of the feelings of failure and poor self-esteem often experienced by students with learning difficulties. These teachers see the behavior of young children as more susceptible to change and they hope to implement appropriate intervention strategies during the important early years of cognitive development. A third major advantage of kindergarten screening is the cost efficiency of these programs. Students with learning problems seem to "catch-up" much quicker if they are given remediation before they reach the intermediate grades (Strag, 1972). Lerner (1981) reported that American children enrolled in preschool Head Start programs needed less special education placement and grade retention during their later school years. A fourth important advantage of early identification screening is the opportunity it provides for teachers and parents to work together to help develop the child's strengths and weaknesses. Teachers and parents can decide on one or more areas of concern, for example, oral language and listening skills, and they can mutually plan some informal home and school activities to stimulate the development of preacademic and behavioral skills.

The opponents of early identification screening programs cite labelling and misdiagnosis as the two major disadvantages of early identification assessment. Most kindergarten screening programs use some form of classification system to divide pupils into low-risk and high-risk groups. Children in the latter category are considered to be those students who are likely to experience learning difficulty in the primary grades. Since most schools delay formal reading instruction until Grade One, prediction of reading difficulties is taking place before the child has been exposed to the subject. The negative effects of this labelling are well-known to anyone in the special education field. Expectations of parents and/or teachers frequently decrease once a student is labelled "high-risk" or "learning disabled." A lower standard of work may be accepted from the child and s/he may be questioned less during class discussions. Children with academic problems often perceive themselves as unable to learn because they feel they are "dumb" or "retarded." This combination of negative self-esteem and lower teacher expectations can directly affect a child's willingness to attempt new work and to take an active part in the learning process.

A second important disadvantage of early identification assessment focuses on the problem of misdiagnosis. A child's success or failure with reading is dependent on a large number of interconnected factors such as teacher competency, background experiences and curriculum demands. Although the effects may vary from year to year, these factors have considerable impact on the child's academic learning experiences. The variables underlying school achievement are complex and changeable and they influence the predictive effectiveness of any early identification instrument.

The problem of misdiagnosis is complicated by the fact that all early identification batteries give some percentage of incorrect classification of low-risk and high-risk students. After a follow-up study has been completed, the predictor and criterion test scores are analyzed to determine the predictive validity or hit rate of the kindergarten screening instrument. The students are classified into one of four groups. Correctly predicted students are placed either in the true negative group (passing predictor and criterion test scores) or in the true positive group (failing predictor and criterion test scores). The incorrectly classified groups are termed false negative (passing predictor scores but failing criterion scores) and false positive (failing predictor scores but passing criterion scores). The hit rate of the early identification instrument is based on the percentage of children in the true negative and true positive groups. Early identification instruments use a cut-off score to separate the low-risk and high-risk students; this cut-off point determines the number of correctly and incorrectly predicted children in each of the four classification groups. Raising the cut-off score can increase the number of false positives and decrease the number of false negatives; lowering the cut-off score can decrease the number of false positives and increase the number of false negatives. Some researchers (Satz & Friel, 1978; Silver, 1979) believe the percentage of false positive subjects in a study should be lower than the percentage of false negative subjects in order to minimize the danger of incorrect labelling of students. Other researchers, notably Jansky and de Hirsch (1972) disagree with this approach as they feel screening test scores should be used not to label students but to alert kindergarten teachers to pupils who may need a diagnostic assessment. Educators involved in early identification programs need to be aware of the above described bias concerning misclassification of students so that they can have a better understanding of test score interpretation.

This section has summarized some of the major issues in the area of early identification assessment. A large number of other factors, however, contribute to the controversy surrounding this topic. Teachers and administrators contemplating setting up a kindergarten screening program must make numerous decisions concerning the type of instrument to be used, individual versus group administration, date of screening test and diagnostic and intervention follow-up procedures. Time and cost efficiency can be an important issue for schools, especially if trained personnel and expensive materials are needed to administer the program.

Much research remains to be done on the validity and reliability of early identification instruments. Most kindergarten screening batteries contain little, if any, reliability data in their teachers' manual and the predictive validity information is often non-existent or poorly described. More and more early identification researchers are designing follow-up studies which incorporate good statistical data and analyses. Such well-controlled research is long overdue.

Purpose of the Study

Since its publication in 1972, the Jansky-de Hirsch Screening Index has become one of the most widely used kindergarten batteries in North America. This instrument consists of five subtests which can be administered in 15 to 20 minutes. Children failing the Screening Index are given a more detailed test, the Diagnostic Battery, which consists of 10 subtests taking approximately one hour to complete. Both tests are individually administered. These two batteries were developed by two American researchers, Jeannette Jansky and Katrina de Hirsch, both well-known language disability specialists. In their 1972 book, Preventing Reading Failure, Jansky and de Hirsch stated that their screening instrument had correctly predicted more than 75% of the subjects involved in a two-year follow-up study.

In 1975, the North Vancouver School District initiated an early identification program with the Jansky-de Hirsch kindergarten battery.

During the first two years of the program, the Screening Index was administered by trained paraprofessionals; from 1977 to the present this instrument has been administered by the school's learning assistance centre (LAC) teacher. The LAC teacher has given the Diagnostic Battery from the beginning of the program. The two screening instruments are given in January and February of the kindergarten year so that appropriate intervention can be provided where necessary. Students who have scored poorly on the Screening Index are usually retested in September of the Grade One year and a decision concerning continuing intervention is made at that time.

The major purpose of this study was to assess the predictive validity of the North Vancouver Jansky-de Hirsch kindergarten screening program. The five-year follow-up study included male and female subjects randomly selected from North Vancouver schools. A total of 30 predictor variables and 43 criterion variables were used in the study. The kindergarten test variables consisted of the subtest measures from the Screening Index and the Diagnostic Battery and the Screening Index total score. Both these tests were administered early in 1976, the former instrument was given to all the subjects and the latter instrument was given only to students who failed the screening battery. The Grade Five measures were administered in the fall of 1980. These instruments included two norm-referenced measures, the Canadian Tests of Basic Skills and the Test of Written Spelling, and one teacher assessment measure, the Watts Student Rating Scale. Information was also collected on a number of other variables such as sex and age of student and special education services given to the subjects.

A variety of descriptive and inferential statistical analyses were utilized in this study. The three major statistical computations were as follows: Pearson correlation coefficients, t-tests and multiple regression analyses. Means and standard deviations were obtained for all predictor and criterion test variables and a comparison was made between some district and national percentile scores. The results of these statistical analyses are presented in Chapter Four and a summary of the results is given in Chapter Five. The research hypotheses used in this study are listed in the following section of this chapter.

Hypotheses Used in the Study

(1) No significant difference exists between the mean scores of the younger and older subjects on the Jansky-de Hirsch Screening Index.

(2) No significant difference exists between the mean scores of the younger and older subjects on the Canadian Tests of Basic Skills and the Test of Written Spelling.

(3) A significant difference exists between the mean scores of the male and female subjects on the Jansky-de Hirsch Screening Index.

(4) No significant difference exists between the mean scores of the male and female subjects on the Canadian Tests of Basic Skills and the Test of Written Spelling.

(5) A significant difference exists between the mean scores of the low-risk and high-risk subjects on the Canadian Tests of Basic Skills.

(6) A significant difference exists between the mean scores of the low-risk and high-risk subjects on the Test of Written Spelling.

(7) The Jansky-de Hirsch Screening Index total score will predict the low-risk and high-risk subjects on the Canadian Tests of Basic Skills.

(8) The Jansky-de Hirsch Screening Index total score will predict the low-risk and high-risk subjects on the Test of Written Spelling.

(9) A significant correlation exists between the raw score and converted score subtests on the Jansky-de Hirsch Screening Index.

(10) A significant correlation exists between the spelling variables on the Canadian Tests of Basic Skills and the Test of Written Spelling.

Significance of the Study

The research results provided in this follow-up study are significant not only for North Vancouver School District but also for other similar school systems involved in early identification assessment. The Jansky-de Hirsch Screening Index has been extensively used in Canada and the United States but no published longitudinal studies have appeared in the special education journal literature (Barnes, 1983). To the best of this researcher's knowledge, only one other North American researcher has undertaken a controlled follow-up study of the predictive effectiveness of the Jansky-de Hirsch kindergarten battery (Barnes, 1982, 1983). In his book, Preschool Screening (1982), Barnes stated that the 1972 Screening Index was based on years of developmental research done by Jansky, de Hirsch and their colleagues. Barnes criticized the lack of validity and reliability studies on this instrument. He stated that the Jansky-de Hirsch Screening Index was a "promising" early identification battery which needed much more statistical analysis with large samples of students. This five-year follow-up study provided some of the required data for this needed research.

Limitations of the Study

The research data from this longitudinal study was based on test scores obtained from elementary students in North Vancouver. This school district is located in a middle to upper-middle socioeconomic area; the parents of its students tend to be well-educated and interested in their school system. North Vancouver School District has earned a reputation for academic excellence and its students usually achieve above average scores on Canadian standardized tests. This research study was designed primarily for the use of North Vancouver educators who wanted to check the predictive validity of the Screening Index and establish district norms for this instrument. Some of the statistical data in this study, specifically means and percentiles, reflect the above average academic standing of North Vancouver elementary students. Educators should be cautious about generalizing the results of this research study as the data may not be valid for their school system. The study's results and conclusions should only be generalized to those school districts which have an academic standing and socioeconomic level comparable to North Vancouver.

Overview of the Study

This thesis consists of five chapters, a reference list and four appendixes. Chapter One began with an introduction to some of the major issues in early identification assessment. The latter part of this chapter included the purpose, limitations and significance of the study as well as the hypotheses to be researched and a short definition of terms.

Chapter Two presents a review of the early identification literature and a description of several well-known screening instruments.

Chapter Three gives the specific details of the methodology and design used in this study and Chapter Four presents the results of the statistical analyses for the predictor and criterion variables.

Chapter Five reviews the hypotheses and summarizes the results of the statistical analyses presented in the previous chapter. A list of recommendations arising from the study and a summary conclude this chapter.

Definition of Terms

Variables	-	Qualities or characteristics which can be assigned different numerical values.
Predictor Variables	-	Qualities or characteristics measured at the kindergarten level.
Criterion Variables	-	Qualities or characteristics measured at the Grade Five level.
Precursor Variables	-	Pre-academic variables thought to be important for reading success.
Low-Risk Subjects	-	Students who receive passing scores on the kindergarten and/or Grade Five test variables.

High-Risk Subjects -	Students who receive failing scores on the kindergarten and/or Grade Five test variables.
At-Risk Subjects -	Another term for high-risk subjects.
Younger Subjects -	Students who were born on or after July 1, 1970.
Older Subjects -	Students who were born on or before June 30, 1970.
Instrument -	A measurement tool.
Battery -	An instrument which consists of two or more subtests.
Hit Rate -	The percentage of correctly classified students in an early identification follow-up study.
True Negatives -	Low-risk Grade Five students who had passing marks on the Screening Index total score.
True Positives -	High-risk Grade Five students who had failing marks on the Screening Index total score.
False Positives -	Low-risk Grade Five students who had failing marks on the Screening Index total score.
False Negatives -	High-risk Grade Five students who had passing marks on the Screening Index total score.

CHAPTER TWO

Review of the Literature

This chapter is divided into two main headings. The first section presents a literature review of a number of variables which are thought to be precursors for reading success. The second section describes some of the well-known screening instruments commonly used in early identification assessment.

Single Variable Precursors of Reading Achievement

Physiological Variables

A variety of physiological factors have been examined in the search for the precursors of learning difficulties. Three of the most frequently investigated variables have been premature births, central nervous system (CNS) damage and low birth weight. Eaves, Kendall and Crichton (1972, 1974) studied the predictive validity of a screening battery (MPI) composed of the Predictive Index (de Hirsch, Jansky and Langford, 1966), a name printing task and the Draw-a-Person test. Fifty of the 228 children involved in the two-year study were given a neurological examination and a second MPI administration in June of their kindergarten year. Two of the significant correlations reported between these two measures were as follows: abnormal birth, one of the neurological variables, was correlated .57 with the Bender-Gestalt Test and .53 with the Wepman Auditory Discrimination Test. In their second article, the authors stated that the neurologist's involvement in this study had been somewhat redundant as a close correlation had been found between his predictions and teachers' predictions of at-risk children.

Gottesman (1975) did a three- to five-year follow-up of 58 reading disabled students referred to a medical clinic. She reported that although 47% of these children were considered to be at-risk of having some CNS damage, no systematic relationship seemed to exist between this at-risk group and the severity of the reading disability. However, these at-risk children did have a higher incidence of neurological and psychiatric signs of abnormality when compared to several other studies of good readers and non-clinic poor readers.

Balow, Rubin and Rosen (1975-1976) reviewed 28 studies which had investigated the relationship between reading failure and prenatal and/or perinatal complications. Twenty of these studies had found some degree of relationship between these two variables; eight studies had found no significant relationship.

In a comprehensive literature review of the medical antecedents of learning disabilities, Eaves (1982) stated that most researchers reported a greater number of academic problems with children who had a low birth weight or a premature birth. However, in her own seven-year follow-up study of 57 children, Eaves (1982) found no significant differences in the number of abnormal birth events between the at-risk subjects and the control group.

Visual Perceptual Variables

During the past two decades, a large number of studies have investigated the relationship between visual perceptual skills and academic failure in elementary school. Most beginning reading programs place a heavy emphasis on phonetic analysis and/or sight word recognition, both of which demand a high degree of visual perceptual competency. Students having problems in reading and spelling often exhibit some degree of difficulty in one or more of the following areas: visual discrimination, visual-motor integration, visual memory and auditory-visual association. Although many readiness tests and early identification batteries include some measure of visual perceptual proficiency in their screening program, researchers have not yet come to any consensus about the importance of visual perception as a precursor to learning difficulties.

Gruen (1972) found that perceptual motor tests were better indicators of Grade One reading achievement than cognitive-intellectual tests; the reverse, however, was true when the subjects were checked at the end of Grade Three. Eaves, Kendall and Crichton (1974) examined 196 variables during their two-year follow-up study and they concluded that several of the factors that predict reading and writing do not seem to be visual-perceptual tasks. Several researchers have noted that visual perception seems to play an important role in the beginning stages of reading and cognitive and linguistic competencies become more essential in the more advanced stages of reading (Jansky and de Hirsch, 1972; Satz, Taylor, Friel and Fletcher, 1979).

Follow-up studies of the Frostig visual perceptual test, a widely used instrument in the 1960's, reported that this test had little predictive value in determining reading achievement (Olson, 1968).

The Bender Visual-Motor Gestalt Test has been extensively used as an instrument for predicting reading success or failure. Keogh (1965) investigated the predictive validity of this instrument during a longitudinal study involving 127 children. These students were given the Bender Gestalt Test during their kindergarten year and a standardized reading test was administered to them during their third grade year. Teacher ratings were also obtained for the subjects. Keogh found the Bender Gestalt to be of limited value as a diagnostic test of reading difficulty in her follow-up study.

Norfleet (1973) gathered group-administered Bender Gestalt scores from 311 beginning Grade One students and compared the results with a standardized reading test given at the end of the second grade. Although the chi-square analysis was significant for both the no-risk and high-risk groups, the Bender Gestalt cut-off scores were more accurate in predicting the good readers than the poor readers. Gross and Rothenberg (1979), in their summary article on visual perceptual assessment, stated that there is no standardized visual perceptual test that reliably differentiates the student having reading difficulty from the student having reading success. These authors emphasized, however, that presently available standardized psychometric tests may not adequately measure those visual perceptual areas that are important when learning to read.

Auditory Perceptual Variables

Researchers have examined a number of auditory perceptual factors in their search for the best precursors of learning difficulties. Most of these studies have concentrated on one or more of the following areas: auditory discrimination, auditory blending, auditory memory and auditory-visual integration. Dykstra (1967) examined auditory discrimination of initial phonemes and found it to be an effective predictor of later reading ability. Wepman (1960) checked the reading test scores of first grade students and discovered that the poor readers and good readers had significantly different scores on his auditory discrimination test. Eaves et al. (1974) stated that digit repetition was an important variable in predicting the Grade Two teacher's estimate of the student's reading level. Chall, Roswell and Blumenthal (1963) reported a strong positive relationship between first grade auditory blending ability and third grade reading competence. Jansky and de Hirsch (1972) asserted that three interrelated auditory perceptual skills, sequencing, discrimination and memory span, appeared to be crucial for the task of reading. However, the multiple regression equation used for their Screening Index indicated the Binet Sentence Memory was the weakest predictor of the five subtests in determining Grade Two reading comprehension scores. Larsen and Hammill (1975), in their review of the predictive validity of various perceptual factors, asserted that auditory discrimination, auditory memory, blending and auditory-visual integration were not useful predictors of reading ability.

Researchers disagree about the importance of auditory perception in the prediction of reading difficulties. It should be remembered that auditory perception, like visual perception, is a composite term for a number of subskills which are difficult, if not impossible, to measure in a short time frame.

Letter Naming

A child's familiarity with the English alphabet has consistently been found to be a good predictor of future reading achievement. Letter naming and letter matching tests have been used for several decades as predictors of academic progress. Silver (1979) reported that in 1928, Smith found a correlation of .87 between a letter matching task and a word recognition test administered two weeks after the predictor measure. Askov, Otto and Smith (1972) checked the predictive validity of the original de Hirsch-Jansky kindergarten battery and the Metropolitan Readiness Test (MRT) during a two year follow-up study involving 285 subjects. The MRT alphabet (letter naming) subtest was the most effective predictor for determining second grade reading comprehension scores on both the regression analysis and the discriminant analysis, and it discriminated nearly as well as all the six MRT subtests. Jansky and de Hirsch (1966, 1972) also found letter naming to be the most predictive subtest in their screening battery. Busch (1980) used a sample of 1,052 first grade students to determine the predictive efficacy of six instruments and one teacher check list; the ability to recognize upper and lower-case letters and sounds was the best single predictor of first grade reading achievement in his research battery. Satz et al. (1979), in his longitudinal study of 497 boys, found that alphabet recitation was one of the most important predictors in each of his follow-up studies.

Language

During the past two decades, many researchers have investigated the role of language as a predictor of learning difficulties. A large number of receptive and/or expressive language measures have been used as single predictors or as subtests in screening batteries or intelligence tests. Instruments such as the Wechsler and Stanford Binet intelligence scales tend to emphasize verbal skills and responses; it is not surprising, therefore, that cognitive skills and verbal ability are often perceived as being closely related to each other.

Although language is generally thought of as consisting of four components: phonology, morphology, syntax and semantics, the first three areas are seldom assessed in kindergarten screening batteries. Most early identification instruments measure language proficiency in terms of some form of semantic competence, for example, picture naming, story telling or word definitions.

The relationship between language variables and future school success has been examined by a number of researchers. De Hirsch, Jansky and Langford (1966) investigated 37 kindergarten tests in a two-year follow-up study involving 53 subjects. Fourteen language tests were included in this battery. The most predictive language variable in this study was the number of words used in a story-telling test; only four other language tests were statistically significant in predicting the second grade achievement scores. Haring and Ridgway (1967) used correlation and factor analyses to determine the predictive efficiency of 31 variables administered to 106 kindergarten students. The language related variables were the most significant measures in this battery and they accounted for 20% of the total variance of all the predictor scores. Jansky and de Hirsch (1972) checked the predictive validity of 21 kindergarten tests during a two-year follow-up study of 347 subjects. The correlation analysis revealed that the picture naming and letter naming tests had the highest correlation (.54) with the second grade reading scores. Jansky (1972) regarded the picture naming test as a very important predictor of reading success or failure and she noted that poor readers often have difficulty with retrieval of stored verbal symbols.

Several researchers have used the Peabody Picture Vocabulary Test (PPVT) as the receptive vocabulary measure in their screening battery. Satz, Taylor, Friel and Fletcher (1979) reported that the PPVT was the second most predictive test in their six-year follow-up study of 442 male subjects. Satz' original kindergarten battery was composed of 16 variables, including three verbal-conceptual tests: the WPPSI Similarities subtest, the PPVT and a verbal fluency measure (Satz and Friel, 1978). Although none of these three instruments had high predictive validity in the 1971-1975 follow-up studies of Satz' battery, the PPVT became a significant predictor measure at the fifth grade level (Satz et al., 1979). These results would appear to lend credence to Satz' theory that immature primary children tend to be developmentally delayed in their visual-perceptual and cross-modal sensory integration and immature intermediate children tend to be developmentally delayed in linguistic and conceptual areas.

Lewis (1980) screened 161 students with the English Picture Vocabulary Test (EPVT), a modified version of the PPVT. The classroom teachers were then asked to complete the Croydon teacher's checklist for the following students: (1) subjects who scored below 90 on the EPVT; and (2) subjects who scored 90 or above on the EPVT but were still considered to be at-risk for learning difficulties. Two years after the initial screening, a standardized reading test was administered to 86 of the original subjects. Lewis stated that the EPVT did not predict the second grade reading scores as well as the Croydon teacher's checklist; the latter measure had a correctly predicted hit rate of 81-85% compared to the former measure which had a correctly predicted hit rate of 73-79%. The majority of at-risk girls in this study were identified far more accurately with the EPVT than the Croydon checklist; the at-risk boys, however, were identified mainly by the teacher checklist.

Intelligence

A large number of studies have investigated the predictive effectiveness of intelligence tests in determining reading success or failure. These tests have been used both as single predictors or as part of a research battery. Hagin, Silver and Corwin (1971) studied the predictive validity of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) with 70 first grade students who were divided into low-risk and high-risk groups on the basis of neurological and perceptual test scores. Results from this study indicated there was no significant difference in the means of the vocabulary subtest for the two groups. Even when the subjects were matched for sex and full-scale WPPSI scores, no consistent verbal-performance differential was evident in the means of the high-risk and low-risk groups.

Hinton and Knights (1971) examined the predictive efficacy of a neuropsychological battery administered to 67 children during a three-year follow-up study. All subjects were experiencing learning difficulties at school and had been referred to a pediatric neurologist for examination. The authors reported that for this selected at-risk group, school progress was best predicted by language measures rather than the neuropsychological motor coordination tests. The WISC verbal IQ score was a very important variable in determining academic success.

Pikulski (1973) used two readiness tests and the Pintner Cunningham Intelligence Test to predict reading and spelling achievement test scores in Grade Six. The author reported that the three predictor measures had comparable correlation coefficients and he recommended the use of readiness tests rather than intelligence tests for predicting academic success.

Keogh and Becker (1973) cautioned educators not to use intelligence scores within the low average to superior range as the only predictor of academic progress. They stated that IQ measures have limited predictive value for children who are labelled "educationally handicapped" or "learning disabled" and that many teachers have learning disabled students who have high intelligence test scores. These researchers also emphasized that there was considerable evidence to suggest children's intelligence was malleable during the early years rather than a fixed trait predetermined at birth.

Lesiak (1973) used a sample of 545 subjects to check the predictive validity of 15 tests and rating scales. This battery included the following four measures of intellectual functioning: the Cognitive Abilities Test (CAT), the Slosson Intelligence Test (SIT), a group draw-a-man test and a teacher nomination scale for "slow learners." The SIT was administered to all children who scored 90 or below on the CAT. Lesiak found a significant difference in the means of these two intelligence measures. The CAT scores were consistently lower than the SIT scores; the differences ranged from 18 points at the kindergarten level to nine points at the third grade level. The teachers' accuracy in selecting "slow learning" students was 68% correct compared to the CAT scores. The teachers tended to do a better job of identifying older children and they were more accurate in their choice of girls (80%) than of boys (62%).

Summary of Single Variable Precursors

This literature review has surveyed a number of variables which have been widely investigated as predictors of learning difficulties. Although varying degrees of positive correlations were reported between most of these variables and future academic achievement, a lack of consensus was often apparent among researchers using the same predictor instrument. Many of these studies could not be accurately compared as they differed considerably in their methodology, criterion instruments and/or statistical analyses. The search for single predictors gradually decreased as more and more research was completed in the field of early identification. It became increasingly evident that complex areas such as language, perception and intelligence could not be adequately assessed by one screening instrument used in isolation. A combination of tests was required which would measure those developmental areas which were considered to be important precursors of academic success or failure.

Batteries for the early identification of learning difficulties began to be developed in the mid-1960's shortly after the term "learning disabilities" was coined at a 1963 education conference. The publication of studies by de Hirsch and Jansky (1966) and Haring and Ridgway (1967) stimulated considerable interest in kindergarten screening and they laid the foundation for much of the early identification research done in the next few years. During the 1970's, educators became increasingly aware of the need for early identification of high-risk children. Many school districts across North America began implementing some type of kindergarten screening program using either a locally developed battery or one of the many batteries available in published form. The demand for early identification programs continued to increase throughout this decade and by 1976 more than 1,000 instruments were available for the screening and diagnosis of young children (Zeitlin).

Early Identification Batteries

The following section summarizes some of the widely recognized early identification batteries developed during the past 18 years.

The Predictive Index

This instrument was one of the earliest screening batteries and it aroused considerable interest when it was first published in 1966 (de Hirsch, Jansky and Langford). The battery was designed by three language specialists, Katrina de Hirsch, Jeannette Jansky and William Langford, who worked at the Pediatric Language Disorder Clinic, Babies Hospital, Columbia-Presbyterian Medical Center in New York City. The pilot study involved a sample of 53 children of kindergarten age who had been born at Babies Hospital. A total of 37 perceptual and linguistic tests were administered to these children during their kindergarten year and follow-up testing was done at the end of Grade One and the end of Grade Two. Correlation coefficients were computed between the predictor and criterion measures and this data analysis was used to select the ten tests which eventually formed the Predictive Index. This battery was composed of the following subtests:

(1) Pencil Use
(2) Bender Visuo-Motor Gestalt Test
(3) Wepman Auditory Discrimination Test
(4) Number of Words Used in a Story
(5) Categories
(6) Horst Reversals Test
(7) Gates Word-Matching Test
(8) Word Recognition I
(9) Word Recognition II
(10) Word Reproduction

The Predictive Index was to be given during the second half of the kindergarten year and the scores, along with the teacher's judgment, were to be used to determine a student's readiness to enter Grade One. The authors of this battery believed that a child's level of maturation was the crucial factor in predicting future school success. They recommended the establishment of readiness classes to help immature children make the transition from kindergarten to first grade with a minimum of failure and frustration.

The Predictive Index was intended to be a preliminary study and it was extensively revised in 1972. Although it lacked adequate sample size and sophisticated data analyses, this instrument has always been considered to be one of the first important early identification batteries.

The Haring-Ridgway Battery

Another battery which became well-known during the late 1960's was the one developed by Norris Haring and Robert Ridgway (1967). These two educators designed a kindergarten battery comprised of the following eight diagnostic measures:

(1) Illinois Test of Psycholinguistic Abilities (ITPA)
(2) The Detroit Tests of Learning Aptitude (four subtests)
(3) PISCI Auditory Discrimination Evaluation
(4) The Wide Range Achievement Test
(5) The Developmental Test of Visual-Motor Integration
(6) The Purdue Perceptual-Motor Survey
(7) Test of Left Right Discrimination

(8) Physical Measurements

This battery was administered to 106 high-risk subjects who were selected from a population of 1,200 students in a Kansas school district. Unlike most other early identification batteries, a large number of physiological measures were used in this study. These variables included factors such as weight, height, postural reflexes, muscle tone and x-ray age of hand and wrist bones. The physiological measures were taken by medical personnel connected with the study.

Haring and Ridgway found that few common learning patterns emerged from the statistical analysis of their battery. The language related variables accounted for 20.01% of the commonality in the factor analysis but no common discernible factors could be identified with the remaining components. The authors concluded their study by stating that teachers' individual behavior analysis may prove to be a more effective early identification procedure than group testing of kindergarten children.

Meeting Street School Screening Test

This individually administered screening battery was developed by Hainsworth and Siqueland (1969) for use with kindergarten and first grade children. Based on Osgood's information processing model, the Meeting Street School Screening Test (MSSST) is composed of three subtests: (1) Motor Patterning; (2) Visual-Perceptual-Motor; and (3) Language. Areas assessed include: movement patterns, spatial awareness, visual discrimination and reproduction of letter forms. The raw scores are converted to scaled scores for each subtest and then to a total test score depending on the student's chronological age. Both the MSSST and the following instrument, the First Grade Screening Test, were developed in the late 1960's and they became two of the most widely used batteries in the early 1970's.

First Grade Screening Test

Intended for use at the end of kindergarten or the beginning of Grade One, the First Grade Screening Test (FGST) was published by Pate and Webb in 1969. This group-administered battery consists of 27 items which sample a variety of perceptual, behavioral and pre-academic skills. Areas tested include: general knowledge, body image, memory and perceptions of parental figures and appropriate play. Separate booklets are provided for boys and girls. The development of local cut-off scores is recommended based on the needs, resources and goals of the individual school district.

The FGST was normed on a large number of students; approximately 3,200 kindergarten children and 5,500 first grade children were used in the standardization. Unlike many other early identification batteries, this instrument contains data on both validity and reliability. Its publication in 1969 by one of the best known American testing companies helped ensure the test's popularity for the next few years.

The Screening Index

In 1972, Jansky and de Hirsch brought out the Screening Index, a revised edition of their 1966 early identification battery. The revision was done primarily by Jeannette Jansky and she also developed a more detailed instrument, the Diagnostic Test Battery, to supplement the Screening Index. Both new tests were published in Preventing Reading Failure (1972), Jansky and de Hirsch's second book on early identification.

The revised screening battery evolved from a two-year follow-up study of 347 students enrolled in five New York City schools. Nineteen standardized and informal tests were administered to these pupils during the spring of their kindergarten year and eight reading, spelling and writing instruments were given to them during their Grade Two year. A total of 12 criterion measures were used as some of the second grade tests were subdivided into two or three scores. Correlation coefficients were computed on the predictor and criterion variables and stepwise multiple regression analysis was done on the preliminary battery to determine the best predicting equation. The five most predictive kindergarten tests were as follows (in order of importance):

(1) Letter Naming
(2) Picture Naming
(3) Gates Word Matching
(4) Bender Motor Gestalt
(5) Binet Sentence Memory

These five tests were put together to form the Screening Index. A weighted formula was used to change the subtests' raw scores to converted scores, the latter being added together to get a total score called an Index Score.

Unlike most early identification batteries, the Screening Index utilizes different conversion tables for sex and race. Separate tables are provided for the following four groups of students: white boys, white girls, black boys and black girls. The differentiation by race is primarily a socioeconomic distinction; the sample of white students was drawn from middle class schools and the sample of black students was drawn from inner city schools. Jansky felt it was unfair to use the same cutoff Index Score for both sets of students as the two groups usually have a wide disparity in their sociocultural background. She also recommended that each school develop its own cutoff score based on its percentage of failing second grade readers.

Students who fail the Screening Index are given the Diagnostic Battery which consists of ten subtests plus a seven item student rating scale and the five Screening Index subtests. This battery developed from research done by Jeannette Jansky for her doctoral dissertation. The 19 kindergarten tests used in the follow-up study were factor analyzed and multiple correlation and regression analyses were then computed to determine the factors' contribution to second grade reading. Five factors were identified but only four factors were used for the new instrument as one factor had an insignificant contribution. Jansky organized the Diagnostic Battery on the basis of these four factors: (1) oral language; (2) pattern matching; (3) pattern memory; and (4) visuo-motor organization. Each of the 15 subtests in the battery are listed under one or two of the four categories.

The Diagnostic Battery is composed of the Screening Index subtests and the following ten subtests:

(1) Name Writing
(2) Nonsense Word Matching
(3) Roswell-Chall Auditory Blending
(4) Boston Speech Sound Discrimination
(5) Tapped Patterns
(6) Category Names
(7) Oral Language
(8) Word Recognition
(9) Spelling of Two Words Previously Taught
(10) Pencil Use

After administration of this instrument, the examiner marks each of the 15 subtests as "poor," "fair," or "good" and completes a diagnostic profile sheet for every student. The kindergarten teacher uses the same three categories to complete the student rating scale, the second half of the Diagnostic Battery. This section, called "Additional Observations and Impressions," consists of the following seven variables:

(1) Ability to Listen
(2) Understanding of Directions
(3) Need to Move About
(4) Pleasure in Working with Crayons and Pencil
(5) Working Alone
(6) Persistence
(7) Independent Thinking

Jansky recommended that the Diagnostic Battery scores be carefully analyzed and an intervention program be designed for those students who scored "poor" in one or more areas.

The results of this two-year follow-up study were favorably received by many educators throughout Canada and the United States. The Screening Index correctly identified 79% of the kindergarten students who received failing reading scores at the end of Grade Two. The overall false positive rate for the four groups of children was 22%; the false positive rate for the white girls, however, rose to 32%. The true positive levels for the four groups were all above 75%. This study correctly predicted 83% of the white boys, 77% of the black girls, 76% of the black boys and 79% of the white girls who were poor readers at the end of Grade Two.

The Satz Battery

One of the most widely publicized early identification studies in North America has been the long term follow-up study designed by Paul Satz and his colleagues. Their research findings have been printed in numerous journals and books and presented at a large number of national and international conferences.

Unlike most early identification instruments, the Satz battery evolved from a theoretical framework postulated by the authors. Satz et al. (1979) hypothesized that "reading disabilities reflect a lag in the maturation of the brain which differentially delays those skills which are in primary ascendancy at different chronological ages" (p. 319). Satz and his colleagues elaborated on this statement by theorizing that visual-perceptual and cross-modal sensory integration skills develop chronologically earlier than conceptual-linguistic skills. The former abilities are considered to be developmentally more important in the kindergarten and early primary years while the latter abilities come into ascendancy more in the later primary and intermediate years. According to this maturational lag theory, immature kindergarten children tend to manifest more delays in their visual-perceptual and cross-modal integrative skills compared to their normally developing classmates.

The Satz battery was based on the above theoretical model. A total of 14 subtests were used in the standardization of this battery which was normed on a sample of 497 male kindergarten students enrolled in 20 Florida elementary schools. All subjects were tested individually under uniform conditions during the early part of their kindergarten year. No female students were used in this study.

The 16 variables used in the standardization included the 14 subtests plus the subject's age and date of testing. A factor analysis of the 14 measures yielded three different factors: (1) a general sensorimotor-perceptual factor; (2) measures of verbal-conceptual function; and (3) a verbal-cultural factor.

One of the major reasons for the widespread interest in the Satz battery has been the length of its follow-up study. Most early identification follow-up studies monitor their subjects for one to three years; Satz and his colleagues, however, monitored their subjects from kindergarten (1970) to the end of Grade Five (1978). Although the third year and sixth year studies received the most publicity, follow-up studies were completed at the end of each school year with the exception of Grade Four.

The third year follow-up study used two criterion reading measures to check the predictive validity of the kindergarten standardization battery. The first criterion variable was the student's classroom reading level and the second criterion variable was based on a combination of the classroom reading level and a standardized reading test. The scores on each of these two measures were averaged and then divided into four reading groups (Severe, Mild, Average and Superior).

The overall hit rate for the third year follow-up study was 78%, the true positive rate for the severe (poor) readers being 91% and the true negative rate for the superior readers being 97%. The predictive rates for the other two reading groups were less accurate; only 66% of the mildly disabled readers and 68% of the average readers were correctly classified. The predictive accuracy was obviously much better for the two extreme reading groups, the poor readers and the good readers.

A multiple regression analysis was computed on the kindergarten battery in order to determine which variables best discriminated the Grade Two criterion measures. The following kindergarten tests accounted for 77% of the variance: (1) Finger Localization (71%); (2) Alphabet Recitation (76%); and (3) Recognition-Discrimination (77%). The remaining kindergarten tests contributed less than 1% to the 78% hit rate. These results, plus other statistical analyses, showed that an eight test abbreviated battery yielded almost the same predictive accuracy as the complete 16 item standardization battery.

The second major follow-up study undertaken by Satz and his colleagues was completed at the end of Grade Five. A total of 442 subjects took part in this study. Classroom teachers were once again asked to divide their students into one of four reading groups (poor, mild, average and superior) and they were also asked to complete rating scales on their students' handwriting and mathematics skills.

The overall hit rate for the sixth year follow-up study was 72%, slightly lower than the 78% hit rate produced by the third year follow-up study. The predictive accuracy for the Grade Five reading groups was as follows: severe readers (86%), mildly disabled readers (60%), average readers (64%) and superior readers (86%). As was the case in the earlier studies, the two extreme reading groups (severe and superior) were correctly classified most of the time. The same degree of predictive accuracy, however, was not evident for the two middle groups, the mildly disabled and average readers. Satz et al. (1979) found there was considerable overlap between these two reading groups, the movement from one group to another being determined by a variety of factors such as maturation and quality of teaching.

A stepwise discriminant function analysis was computed on the total kindergarten test battery in order to assess each variable's contribution to the Grade Five reading levels. The four most predictive kindergarten tests were as follows: (1) Finger Localization; (2) Peabody Picture Vocabulary Test; (3) the Developmental Test of Visual-Motor Integration; and (4) Alphabet Recitation. The most predictive measure in both the third year and the sixth year follow-up studies was the Finger Localization subtest.

The early identification research undertaken by Satz and his colleagues has aroused widespread interest during the past decade. Satz has been one of the few researchers in this field who has conceptualized a theoretical framework for reading disorders before the development of a kindergarten screening battery. Although numerous early identification instruments have been developed since the mid-1960's, the predictive validity of many of these tests has been unknown due to the lack of follow-up studies. Satz examined the predictive effectiveness of his battery by doing detailed follow-up studies of his subjects for a total of six years. Several replication studies were also completed.

Although Satz' longitudinal research has contributed much to the field of early identification, various aspects of his work have been subject to criticism (Jansky, 1979; Silver, 1979). His kindergarten battery contains few language measures and it is heavily loaded with perceptual and cross-modal tests which support his hypothesis. Teachers and researchers wanting to use the Satz instrument have found it difficult to gain access to the battery as it has only recently been published in commercial form.

The previous section has described some of the major screening batteries published in the 1960's and the 1970's. During the past 20 years, educators have become more aware that children with learning difficulties require early identification assessment and intervention if academic failure is to be prevented. An extensive variety of tests and programs have been developed to meet this need but until recently there has been little integration of these two types of materials. In the last few years, however, a number of early identification programs have been published which combine screening and intervention materials in one kit. Examples of the latter programs include Search and Teach (Silver & Hagin, 1976), Ready Steps (Hillerich & Johnson, 1977) and Santa Clara Plus (Gainer, Zweig, Dole & Watt, 1980). These combination kits, although expensive, have become widely used by many kindergarten teachers who prefer the convenience of a combined screening/intervention program.

Teacher Assessment

In recent years, teacher assessment has played an increasingly significant role in the early identification of learning difficulties. The development of teacher checklists, questionnaires and rating scales has helped to decrease some of the subjectivity involved in teachers' assessments, an area of concern to many researchers. Bryan and McGrady (1972) noted the following advantages of using a teacher rating instrument such as Myklebust's Pupil Rating Scale (1971):

(1) It is economical in terms of money and administration time.

(2) Classroom teachers are involved in the assessment of their students.

(3) It allows for intensive evaluation of at-risk children.

(4) It covers areas not usually testable, for example, social/

emotional development.

(5) It may identify specific areas of disability despite a student's overall adequate performance.

These two authors did not list, however, one of the most important reasons for using teacher rating scales--the utilization of teachers' perceptions of their students' strengths and difficulties.

Numerous researchers besides Bryan and McGrady have advocated the use of teacher observations in early identification assessment. Keogh and Becker (1973) stated that teachers, because of their daily contact with students, are in an advantageous position to recognize behaviors, abilities and problems which have relevance to the educational setting. Becker and Snider (1979) studied the relationship between teachers' comments and future placement in regular and educationally handicapped classes. They concluded that primary grade teachers were a valuable source of information for both predicting and preventing learning problems but they cautioned educators not to use teacher ratings as their only source of screening at-risk students. Lewis (1980) reported that a wide range of social, behavioral, motor and cognitive factors can be assessed through use of a teacher checklist. Busch (1980), in a follow-up study of 1,000 students, found that teacher judgment was the third best predictor of first grade reading achievement, exceeded only by a letters and sounds subtest and a group intelligence test.

Pupil Rating Scale

During the past decade, a large number of teacher assessment instruments have been developed for the early identification of learning difficulties. Some researchers have designed their own evaluation form while others have used some type of published instrument such as Myklebust's Pupil Rating Scale (PRS). Originally published in 1971 and revised in 1981, the PRS has become one of the most widely used teacher observation lists in North America. Developed by Helmer Myklebust, a leading special education author and researcher, the Pupil Rating Scale consists of 24 variables, each of which is rated on a five point scale. These variables are grouped under the following five sections (1981):

I Auditory Comprehension and Memory
  (1) Comprehending Word Meanings
  (2) Following Instructions
  (3) Comprehending Class Discussions
  (4) Retaining Information
II Spoken Language
  (1) Vocabulary
  (2) Grammar
  (3) Word Recall
  (4) Storytelling-Relating Experiences
  (5) Expression of Ideas
III Orientation
  (1) Judging Time
  (2) Spatial Orientation
  (3) Judging Relationships
  (4) Knowing Directions

IV Motor Coordination
    (1) General Coordination
    (2) Balance
    (3) Manual Dexterity
V Personal-Social Behavior
    (1) Cooperation
    (2) Attention
    (3) Organization
    (4) New Situations
    (5) Social Acceptance
    (6) Responsibility
    (7) Completion of Assignments
    (8) Tactfulness

The 1971 and 1981 Pupil Rating Scales vary slightly in their wording but they assess the same 24 variables under the same five headings.

A number of research studies have examined the Pupil Rating Scale to determine its predictive validity and factor structure. Bryan and McGrady (1972) administered the PRS to 359 male students in several elementary grades. The statistical analysis revealed two major findings: (1) the PRS was an efficient, reliable and economical screening instrument; and (2) the factor structure of the PRS consisted of four, rather than five, independent behavioral categories. Harris, Drummond, Schultz and King (1978) factor analyzed the PRS and two other teacher assessment instruments. They concluded that the use of multiple rating scales may be an inefficient use of teachers' time and energy as there was a substantial degree of similarity between the three scales.

Summary

During the past fifteen years, a large number of researchers have developed early identification batteries and published them in journals, books or kit format. These batteries contain a variety of subtests whick purportedly measure some of the important precursors involved in early reading. The nature and degree of these precursors has been a subject of considerable controversy among researchers and this lack of consensus has given rise to a wide diversity of theories and hypotheses. Much research remains to be done in the area of early identification assessment before educators and researchers find some common ground.

CHAPTER THREE

Methodology of the Study

This chapter provides a detailed description of the procedures involved in undertaking a predictive longitudinal study. Information is supplied on subject selection, predictor and criterion instruments and the research design. The results of the statistical analyses are given in Chapter Four and a summary of the research study is presented in Chapter Five.

Procedures

Administrative Approval

As this study involved most of the North Vancouver elementary schools, permission to complete the research had to be obtained first from the school board and then from the elementary principal of each school. School board approval was given in June by Dr. Leo Marshall, at that time Assistant Superintendent in North Vancouver. In August, Dr. Marshall sent a memorandum to all elementary principals providing details of the study and encouraging participation in the five-year follow-up assessment (Appendix A). By the middle of September, 28 of the 31 elementary principals had given oral or written consent to the study being conducted in their school. Three principals decided not to participate in the research study. Two schools had a large number of native Indian students with learning problems and their classroom teachers wanted to minimize the number of standardized tests given to these pupils. The Grade Five teachers at the third school did not want to take part in the follow-up assessment. The 28 schools represented an excellent cross-representation of North Vancouver's elementary school population.

Subject Selection

The sample consisted of 304 subjects located in 28 elementary schools in the North Vancouver School District. Randomly selected from a population of 756 kindergarten students who had received the Jansky-de Hirsch Screening Index in 1976, the sample represented 40% of this population. Seven of the 304 subjects had repeated one school year and were enrolled in Grade Four; the rest of the subjects were enrolled in Grade Five. A total of 155 males (51%) and 149 females (49%) were included in the study. The population was primarily middle to upper-middle class and the majority of the subjects were of Anglo-Saxon origin.

The National Education Association (NEA) table was used to determine the sample size (Knejcie & Morgan, 1970). As the NEA research division recommended a minimum sample size of 254 subjects for a population of 750, the sample size for this study was set at 300 subjects. An additional 15 students were added to the sample to allow for attrition and 11 of these subjects were eliminated because of absenteeism or mobility. The 315 students were selected by a random-number generator computer program developed at the University of British Columbia's computing centre.

A number of procedures were undertaken in September to determine the population and sample for the study. The population consisted of students who were enrolled in a North Vancouver kindergarten in 1975-1976 and were still enrolled in a North Vancouver school in September 1980. Information on kindergarten placement was obtained from the permanent record cards. The learning assistance teacher in each of the 28 schools was asked to check these cards and note the following information: (1) which Grade Four and Grade Five students had attended a North Vancouver kindergarten in 1975-1976; (2) what school/s had been attended; and (3) the students' birthdates. The birthdate was used for verification. Each school compiled a list of these students and their names were matched with the 1,250 Jansky-de Hirsch Screening Index tests given in 1976. A total of 758 names and tests were eventually matched. Each of these 758 Screening Index tests was carefully checked by this researcher to make sure all five subtests had been administered; two tests were eliminated because of incomplete subtests. The population was finalized at 756 students and the sample of 315 subjects was then randomly selected from this population by use of the random-number generator computer program.

Contact with Parents

A letter explaining the purpose of the study was sent to the parents of the 315 subjects (Appendix A). The letter was written by the researcher and sent to the parents by each school's learning assistance teacher. Several parents telephoned the researcher and/or their child's principal to clarify various aspects of the study but no parents refused to have their child participate in the follow-up assessment.

Administration of the CTBS and TWS

The learning assistance teachers were asked to administer the Canadian Tests of Basic Skills and the Test of Written Spelling to the 315 students involved in the study. A workshop was held in September to review the administration of these two tests. All 28 LAC teachers attended this session. Directions for administering the CTBS were given by a CTBS educational consultant, Jim Bourdon, who was at that time a North Vancouver Supervisor of Instruction. Directions for administering the TWS were given by this researcher.

The Canadian Tests of Basic Skills were administered to the subjects during two morning sessions in the last week of October. The first testing period included the vocabulary and reading comprehension subtests (total testing time = 72 minutes) and the second testing period included the four language subtests (total testing time = 67 minutes). The learning assistance centre or the school library were used for the CTBS administration. The students did not seem concerned about the testing as the subjects in most schools represented a wide cross-section of academic ability. The students were told that someone at the school board was doing a study and that they had been randomly chosen, along with several hundred other North Vancouver students, to participate in the study. The term "randomly" was explained by using an analogy of picking names from a hat. The Grade Five teachers at two schools arranged their annual fall standardized testing to coincide with the time periods for the follow-up assessment. In these two situations, the LAC teacher in each school administered the six subtests in the Grade Five classroom and no reference was made to the study or the random selection of students.

The second criterion instrument, the Test of Written Spelling, was administered to the subjects in the first ten days of November. Most of these students were given the two testing sessions in the learning assistance centre. In ten situations, however, the Grade Five teachers asked the LAC teacher to administer the TWS in the classroom so that test results would be available for the whole class. In these ten cases, the subjects' tests were sent unmarked to the researcher and the remainder of the tests were marked by the classroom teacher. Seven of the 315 subjects had failed one grade and their schools were asked to administer the TWS in the learning assistance centre rather than the Grade Five classroom to prevent possible embarrassment to these students.

Administration and Marking of the Watts SRS

The Watts Student Rating Scale (WSRS) was completed by the subjects' classroom teachers during the early part of December. An information sheet describing the items was sent out with the WSRS and the teachers were requested to rate the 14 items as soon as possible in December. Since most of these teachers had taught fifth grade for several years in North Vancouver, they were asked to base the WSRS marking on their perception of an average Grade Five student within this district. This request was modified in the case of the seven Grade Four subjects; their teachers were asked to rate these subjects according to the teacher's perception of an average Grade Four student. To the best of this researcher's knowledge, all Grade Five teachers completing the WSRS questionnaire had one or more years experience teaching this grade. The seven Grade Four teachers were all experienced at the fourth grade level. The 304 Watts student rating scales were checked by the researcher and any items which were double marked or omitted were verified and corrected by contacting the subject's teacher.

Marking of the CTBS and TWS

The North Vancouver School Board provided funding for machine scoring of the Canadian Tests of Basic Skills and the six CTBS subtests were marked by the Educational Research Institute of British Columbia (ERIBC). Three scores were provided for each subtest: grade equivalent, raw score and district percentile.

The Test of Written Spelling was marked by the researcher and her two assistants, both qualified teachers. Each of the 608 subtests was checked by one of the assistants and then double-checked by the researcher.

Marking of the Jansky-de Hirsch Battery

The 304 Screening Indexes and the 52 Diagnostic Batteries were carefully checked by the researcher to ensure that the 1976 marking had been accurately completed. A number of the Screening Index scores had to be changed, especially in the Bender Gestalt subtest, the most subjective of the five subtests. Few errors, however, were detected in the 1976 marking of the Diagnostic Battery. During the first two years of the Jansky-de Hirsch test implementation in North Vancouver (1975 and 1976), the Screening Index was given by trained paraprofessionals and the Diagnostic Battery was given by the learning assistance teacher. Since 1977, both of these instruments have been administered and scored by the school's learning assistance teacher. Although Jansky and de Hirsch (1972) stated that both sections of the Diagnostic Battery should be completed for high-risk students, teacher ratings were only available for 29 of the 52 students given the Part One subtests.

Special Education Background Information

Although its primary purpose was to check the predictive validity of the Jansky-de Hirsch Screening Index, this study also investigated the extent of special education services given to subjects identified as high-risk on the kindergarten battery. Data was collected for all subjects in the following four areas: (1) learning assistance; (2) Orton-Gillingham tutoring; (3) psychoeducational assessment(s); and (4) placement in the district Diagnostic-Remediation Centre (D.C.1). This data was compiled from information obtained from the learning assistance teachers and from the school board office. Two forms were completed by each of the 28 learning assistance teachers. The first form checked which subjects had attended the LAC for one or more years and the frequency and group size of these students' LAC remediation (Appendix B). The first three questions on the second form asked if the subjects had received one or more of the following North Vancouver special education services: Orton-Gillingham tutoring, a psychoeducational assessment and/or assistance at the district's Diagnostic-Remediation Centre. The last two questions on the second form, "Is this student experiencing difficulty with reading?" and "Is this student experiencing difficulty with spelling?" were filled out by the subject's classroom teacher (Appendix B).

The district special education services were verified by information obtained from the North Vancouver School Board. The district psychological records (1975 to 1980) were checked by the researcher in order to find out which subjects had received a psychoeducational assessment for reading and/or spelling difficulties. The names of subjects receiving the other two district services, Orton-Gillingham tutoring and D.C.1 placement, were confirmed by lists maintained by the special education department.

Instruments

The Screening Index

This kindergarten screening battery was developed by two American researchers, Jeannette Jansky and Katrina de Hirsch, for the early identification of learning difficulties. The test is contained in their second book, Preventing Reading Failure, and it is a revised form of their original test, the Predictive Index (1966).

The Screening Index is composed of five subtests which take approximately 15 to 20 minutes to complete. There are no time limitations and individual administration is recommended. A brief description of each subtest is given in Appendix C. The five Screening Index subtests are:

(1) Bender Motor Gestalt
(2) Gates Word Matching
(3) Letter Naming
(4) Picture Naming
(5) Binet Sentence Memory

Scoring for the Screening Index

Unlike most early identification batteries, the Screening Index utilizes a separate scoring system for sex and race. The raw score for each of the five subtests is changed to a converted score by means of one of four tables: black boys, black girls, white boys and white girls. Only the latter two tables were used in this study. The calculation of the converted scores for the four tables was based on a stepwise regression equation. The score-conversion procedures included data adjustment for race and sex subgroups.

Development of the Screening Index

Information on the development of the Screening Index has been given in Chapter Two of this study. This instrument is a revised edition of an early identification battery first published in the mid-1960's.

Validity of the Screening Index

The follow-up predictive study completed by Jansky and de Hirsch is reported in Chapter Two of this study. These two researchers had a hit rate in excess of 75% on their two-year follow-up study and they had more false positive than false negative classifications. Barnes (1982) stated that the Screening Index was a promising early identification instrument but more follow-up studies were needed on its predictive effectiveness.

Reliability of the Screening Index

Jansky and de Hirsch (1972) utilized two methods to estimate the reliability of the subtests used in the development of the Screening Index. The test-retest method was applied to the Gates Word Matching subtest (r = .52). The other four subtests were checked with the Kuder-Richardson formula (#20) and they yielded the following reliability estimates: Letter Naming (r = .89), Picture Naming (r = .86), Binet Sentence Memory (r = .40) and Bender Motor Gestalt (r = .23). No reliability data was provided for the Screening Index total score (Index Score).

Critique of the Screening Index

A brief description of the Screening Index test composition was given in *The Eighth Mental Measurement Yearbook* (Buros, 1978) but no critiques were included on this instrument. Salvia and Ysseldyke (1981) did not review the Screening Index.

The Diagnostic Battery

The Diagnostic Battery is administered to students who appear to be at-risk for future reading and spelling difficulties. The Screening Index converted total score is used to differentiate the high-risk and low-risk students; no specific cutoff points, however, are suggested by the authors. Emphasizing the need for a flexible cutoff score, Jansky and de Hirsch (1972) recommended that each school establish a cutoff point based on its own percentage of second grade failing readers. This flexibility allows for varying academic standards between schools. Students in middle class schools, compared to students in ghetto schools, usually have a much higher academic level due to a more enriched cultural environment and higher teacher/parent expectations. Middle class schools, therefore, would tend to use a higher Screening Index cutoff score than inner-city schools.

The Diagnostic Battery is contained in Appendix F of Jansky and de Hirsch's second book, Preventing Reading Failure (1972). This battery is composed of two sections: Part I which is a series of ten subtests and Part II which is a student rating scale. The first section, Part I, takes approximately 45 to 60 minutes to administer and all subtests are untimed. A brief explanation of each subtest is given in Appendix C. The ten subtests comprising Part I are as follows:

(1) Name Writing

(2) Nonsense Word Matching

(3) Roswell-Chall Auditory Blending

(4) Boston Speech Sound Discrimination

(5) Tapped Patterns

(6) Category Names

(7) Oral Language

(8) Word Recognition

(9) Spelling of Two Words Previously Taught

(10) Pencil Use

Part II of the Diagnostic Battery is composed of a short student rating scale (JSRS) which is completed by the classroom teacher. Each JSRS item is marked "poor," "fair," or "good" and a description of each rating is provided for each item. Termed "Additional Observations and Impressions," the student rating scale consists of the following seven variables:

(1) Ability to Listen

(2) Understanding of Directions

(3) Need to Move About

(4) Pleasure in Working with Crayons and Pencil

(5) Working Alone
(6) Persistence
(7) Independent Thinking

Canadian Tests of Basic Skills

The Canadian Tests of Basic Skills (CTBS) are a comprehensive test battery measuring five major skill areas: vocabulary, reading comprehension, language, work-study and mathematics. All the 11 tests in the battery use a multiple-choice format and they are contained in one pupil booklet. Each test is organized into six levels ranging from Level 9 (Grade 3) to Level 14 (Grade 8) and a primary battery is available for Grades One to Three. Alternate test forms can be used and a metric (M) edition is available. Answers can be hand-scored or machine-marked.

The first six CTBS subtests (Form 4M, Level 11) were used as criterion measures in this study. The reading comprehension (R) and vocabulary (V) sections each have one subtest while the language (L) section has four subtests: Spelling (L-1), Capitalization (L-2), Punctuation (L-3) and Usage (L-4). A brief explanation of each subtest is given in Appendix C. More detailed information can be found in the CTBS teacher's guide (1974) and technical manual (1975).

Development and Standardization of the CTBS

The framework for the CTBS was provided by the extensive research done by the University of Iowa's College of Education in the development of their test battery, the Iowa Tests of Basic Skills (ITBS). The Canadian Tests of Basic Skills are a modified form of the ITBS, a number of revisions being necessary to make the test items suitable for use in Canadian schools. The authors attempted not only to build on the strengths of the ITBS but also to create a test battery which was appropriate for the Canadian educational system (King, Bourdon, Gossling, Grywinski & Moss, 1975). Forms 1 and 2 of the CTBS were first published in 1966 and Canadian educators and test consultants were asked for critiques of this battery before the revised edition (Forms 3 and 4) was developed and published in 1974. Form 5 was published in 1983.

The 1973 CTBS standardization was based on a stratified random sample of 111 schools from all Canadian provinces and the Yukon Territory. Carefully selected to be representative of Canada's English-speaking school population, the schools were stratified according to four criteria: (1) province; (2) elementary versus elementary-secondary schools; (3) number of teachers; and (4) Roman Catholic versus non-Roman Catholic schools. A total of 23,480 students took part in the standardization.

Validity of the CTBS

The CTBS technical manual states that "all the commonly used principles in the validation of test content have been applied in the preparation of individual test items" (King et al., 1975, p. 7). The University of Iowa's extensive research in curriculum practices, test development, technical measurement procedures and test interpretation and utilization laid the groundwork for the content validity of the CTBS. The test items were carefully checked by Canadian specialists to make sure they were appropriate for students in Canada. The technical manual contains no data on the concurrent validity or construct validity of the CTBS.

Reliability of the CTBS

The reliability coefficients were computed using the Spearman-Brown formula and split-half procedures. The Level 11 coefficients for the six subtests used in this study were as follows: Vocabulary (.89), Reading Comprehension (.93), Spelling (.91), Capitalization (.85), Punctuation (.86) and Usage (.88). The standard error of measurement for the raw scores of the six subtests ranged from a low of 2.5 (Usage) to a high of 3.7 (Reading Comprehension). The CTBS reliability coefficients and the standard error of measurement are both satisfactory.

Critique of the CTBS

The Canadian Tests of Basic Skills are a revised Canadian edition of the Iowa Tests of Basic Skills. The latter instrument is discussed in detail by two writers in The Eighth Mental Measurement Yearbook (Buros, 1978). Both researchers reported that the ITBS is a well-designed comprehensive achievement battery with good validity and reliability data. Salvia and Ysseldyke (1981) stated that the development and standardization of the ITBS battery were satisfactory and they commented that the reliability data was adequate but only based on internal consistency. Salvia and Ysseldyke do not mention the Canadian Tests of Basic Skills. Information on the composition of the CTBS instrument is provided in Buros' yearbook but no critiques are presented.

Test of Written Spelling

The Test of Written Spelling (TWS) is a norm-referenced test developed by Stephen Larsen and Donald Hammill for use in Grades One to

Eight. First published in 1976, the TWS is divided into two sections: (1) a Predictable Words subtest consisting of 35 phonetic words; and (2) an Unpredictable Words subtest consisting of 25 non-phonetic words. Instructions are given for both individual and group administration. Tables are provided in the TWS manual for converting the three raw scores (the two subtests and their sum) to three other types of scores: spelling ages, grade equivalents and spelling quotients. Only the three raw scores, however, were used in this study.

Standardization of the TWS

The TWS was standardized on a sample of 4,544 American children from 22 states. The authors list six areas which were controlled during the standardization: grade level, sex, age, social status, geographical area and urban-rural residency.

Validity of the TWS

Larsen and Hammill made a determined effort to provide high-content validity by ensuring that: (1) the TWS words were being taught in the schools; and (2) the predictable and unpredictable words were appropriately divided into phonetic and non-phonetic words. The authors surveyed the ten most widely used American spelling series and chose the 126 words which were common to all series for the experimental form of the TWS. Item analysis was then used to reduce this list down to the final 60 word form. The classification of these words into the predictable and non-predictable tests was based on computer research on phonetic and non-phonetic words.

The concurrent validity of the Test of Written Spelling was examined by correlating this instrument with four other frequently used spelling tests. The computed correlation coefficients were as follows: Durrell Analysis of Reading Difficulty (.90), Wide Range Achievement Test (.84), California Achievement Test (.80) and SRA Achievement Series (.69). The TWS had a higher correlation with the first two tests which use an oral-dictation format than with the latter two tests which use a multiple-choice format.

Reliability of the TWS

The reliability of the TWS was checked with the Kuder-Richardson Formula (#21). Internal-consistency estimates of reliability are listed for the predictable, unpredictable and total scores for each of the eight grade levels. Only four of the 24 reliability coefficients are below .82. Lower coefficients were found for the three first grade scores (.50 to .78) and one second grade score (.76). Reliability coefficients for the Grade Five level were: predictable words (.83), unpredictable words (.88) and total score (.90).

Critique of the TWS

The TWS was chosen as the major criterion spelling measure for this study because of its good validity, careful norming and satisfactory reliability. Salvia and Ysseldyke (1981, p. 424) stated, "The reliability is adequate; the validity information is excellent. In all, the TWS appears to be a valuable tool." Although the TWS and the L-1 subtest of the CTBS are both measures of spelling competency, the oral-dictation format of the TWS is more closely related to the type of spelling tests given in most North American classrooms. Multiple-choice spelling tests tend to be more limited to standardized test batteries such as the CTBS.

Watts Student Rating Scale

This 14-item student rating scale (WSRS) was developed by the researcher to provide data on the student's academic, social and behavioral progress in Grade Five. The five-point scale consisted of ten items concerned with academic ability, three items concerned with behavior and one item concerned with social relationships. An information sheet giving a brief description of each item was included with the student rating scale. Copies of the WSRS and the information sheet are provided in Appendix C.

Validity of the WSRS

The WSRS items and definitions were designed by the researcher, a former elementary teacher and administrator with many years of experience at the intermediate grade level. The student rating scale and the information sheet were checked by several experienced Grade Five teachers, two elementary consultants and one statistician before they were sent to participating teachers. After the latter group completed the student rating scale, the researcher queried several of these teachers about the utility of the WSRS. They responded that the WSRS had been easy to understand and to mark. No negative comments on the WSRS were received by the researcher.

Reliability of the WSRS

No reliability indices were computed on the Watts student rating scale.

Design

This five-year follow-up study involved 304 subjects who were randomly selected from a population of 756 students in the North Vancouver School District. The Jansky-de Hirsch Screening Index was administered to all subjects during their kindergarten year (1975-1976) and a more comprehensive test, the Jansky-de Hirsch Diagnostic Battery, was given to students receiving poor scores on the Screening Index. The follow-up testing took place in the fall of 1980. It consisted of six subtests from the Canadian Tests of Basic Skills and two subtests from the Test of Written Spelling. A 14-item student rating scale was completed by each subject's teacher and used as the third criterion instrument. Additional information was collected on all subjects and included age, sex and special education background. A total of 30 predictor variables and 43 criterion variables were gathered in this study. Each of the predictor and criterion test instruments used a quasi-interval scale.

The subjects were divided into low-risk and high-risk groups on the basis of their kindergarten and Grade Five test scores. Subjects with a Screening Index total score of 50 or below were considered high-risk kindergarten students and subjects with a Screening Index total score above 50 were considered low-risk students for potential learning difficulty. (North Vancouver School District has used a cutoff point of 50 since the beginning of the Janksy-de Hirsch program in 1975.)

The division of the Grade Five subjects into low-risk and high-risk groups was determined by the following criteria: all subjects receiving criterion subtest scores one standard deviation or more below the mean were classified as high-risk for difficulty in that subtest area. All other subjects were categorized in the low-risk group.

The 30 predictor variables utilized in this study consisted of the 11 raw score and converted score Screening Index measures and the 17 variables comprising Part I and Part II of the Diagnostic Battery. The two remaining predictor variables were sex of student and chronological age calculated in days from the kindergarten entry cutoff date of December 31, 1970.

The 43 criterion variables included the CTBS, TWS and WSRS test scores and background information on learning assistance remediation and district special education services. The two questions concerning Grade Five difficulty with reading and spelling were considered two of the criterion variables.

A variety of descriptive and inferential statistics were used to examine the predictor and criterion variables chosen for this study. The SPSS computer program (Statistical Package for the Social Sciences, 1979) was selected for the data analyses and the level of confidence was set at .05. Means and standard deviations were computed for all the kindergarten and Grade Five variables.

This study was primarily designed to assess the predictive validity of the Jansky-de Hirsch screening battery. A number of t-test analyses were used on the predictor and criterion test variables to determine if the low-risk and high-risk group means were significantly different. Pearson inter-variable correlation coefficients were computed for much of the data and multiple regression analysis was utilized to determine the amount of explained variance between the independent and the dependent variables. The results of these statistical analyses are presented in the next chapter.

CHAPTER FOUR

Results of the Study

This chapter presents and discusses the results of the statistical analyses used in this study. Means and standard deviations for the predictor and criterion test variables are given in the first part of the chapter. The second section focuses on the results of the t-test and correlation analyses and the third section reveals the proportion of explained variance as a result of multiple regression analyses. The last part of this chapter presents the predictive classifications produced by this study.

Subjects

The subjects for this study consisted of 315 students randomly selected from a population of 756 Grade Five pupils who received the Jansky-de Hirsch Screening Index during their kindergarten year. Attrition accounted for 11 subjects being removed from the study before the criterion test administration. The final sample of 304 subjects represented 24% of the 1975-1976 kindergarten population and 22% of the 1980-1981 Grade Five population. The subjects were enrolled in 28 elementary schools in North Vancouver, British Columbia. A total of 155 males (51%) and 149 females (49%) took part in the study.

Age

British Columbia public schools use a cut-off date of December 31 to determine a child's eligibility for kindergarten and Grade One enrolment.

Two hundred and ninety of the 304 subjects had their fifth birthday sometime in the 1975 calendar year. The remaining 14 students were divided as follows: nine early entry pupils with birthdates in January or February 1976 and five late entry pupils with birthdates ranging from June to December 1974. The mean age of the sample was 5.6 years as of December 31, 1975.

The Jansky-de Hirsch Screening Index

This kindergarten screening battery was the major predictor instrument used in the study. Means and standard deviations for the 11 Screening Index variables were computed for the 304 subjects (Table 1) and for the male and female groups (Table 2). The Index Score mean for the total sample was 58.74 with a standard deviation of 11.65. The Index Score mean for the 155 male students was 60.35 compared to 57.07 for the 149 female students. This difference in male and female Index Score means may be due to the more favourable converted score weighting given to boys in the Jansky-de Hirsch Screening Index. Data on the t-test, correlation and multiple regression analyses for this instrument are reported in the latter sections of this chapter.

The Jansky-de Hirsch Diagnostic Battery

The Diagnostic Battery consists of two sections: (1) ten individually administered subtests; and (2) a seven-item student rating scale (JSRS) which is completed by the kindergarten teacher. The Screening Index measures are considered part of the Diagnostic Battery. A total of 52 subjects in this study (24 males and 28 females) received scores of 50 or less on the Screening Index and were given the ten subtests which comprised Part One of the Diagnostic Battery. Student rating scales were completed for only 29 of the 52 students. The 52 students given the Diagnostic Battery subtests comprised 17.11% of the total sample. Although 69 subjects in this study received Screening Index scores of 50 or below, Diagnostic Battery tests were only given to 52 of these students. The remaining 17 pupils obtained passing Screening Index scores in 1976 but these scores were changed to 50 or below when the Screening Index tests were remarked by the researcher.

Means and standard deviations for the Diagnostic Battery variables are listed in Table 3. Raw scores only were used for the ten subtests and the student rating scale, the latter measure being scored on a three-point scale. The means for the JSRS variables ranged from 1.52 (Independent Thinking) to 2.14 (Need to Move About).

Table 1

Means and Standard Deviations for 304 Subjects on the Jansky-de Hirsch Screening Index

Variable	Mean	S.D.
Raw Scores		
Bender-Gestalt	5.23	1.01
Word Matching	7.71	2.71
Letter Naming	5.13	1.57
Picture Naming	14.86	2.63
Sentence Memory	2.03	0.66
Converted Scores		
Bender-Gestalt	11.68	3.43
Word Matching	6.36	3.73
Letter Naming	15.54	4.78
Picture Naming	15.41	3.69
Sentence Memory	9.75	3.21
Total Index Score	58.74	11.65

Table 2

Means and Standard Deviations for 155 Male Subjects and 149 Female Subjects on the Jansky-de Hirsch Screening Index

	Male Subjects		Female Subjects	
Variable	Mean	S.D.	Mean	S.D.
Raw Scores				
Bender-Gestalt	5.20	1.00	5.26	1.02
Word Matching	7.37	2.64	8.07	2.74
Letter Naming	5.00	1.61	5.27	1.53
Picture Naming	15.46	2.28	14.23	2.82
Sentence Memory	2.00	0.66	2.07	0.66
Converted Scores				
Bender-Gestalt	11.98	3.50	11.37	3.34
Word Matching	6.06	3.79	6.67	3.65
Letter Naming	15.51	4.97	15.58	4.59
Picture Naming	16.80	3.10	13.97	3.71
Sentence Memory	10.00	3.32	9.49	3.07
Total Index Score	60.35	11.36	57.07	11.75

Table 3

Means and Standard Deviations for High-Risk Subjects on the Jansky-de Hirsch Diagnostic Battery

Variable	Mean	S.D.
Part I *		
Name Writing	2.67	0.65
Nonsense Word Matching	5.17	2.84
Roswell-Chall Auditory Blending	4.60	2.59
Boston Speech Sound Discrimination	18.29	4.02
Tapped Patterns	2.67	1.22
Category Names	2.92	1.03
Oral Language Level	1.22	0.64
Word Recognition	1.50	0.58
Spelling of Two Words ...	2.83	1.41
Pencil Use	2.40	0.82
Part II **		
Ability to Listen	2.07	0.65
Understanding of Directions	1.69	0.54
Need to Move About	2.14	0.69
Pleasure ... with Crayons and Pencil	1.93	1.00
Working Alone	1.83	0.81
Persistence	1.90	0.67
Independent Thinking	1.52	0.79

* n = 52 subjects ** n = 29 subjects

Canadian Tests of Basic Skills

The major criterion test measures used in this study were the Canadian Tests of Basic Skills and the Test of Written Spelling. These nine variables were statistically analyzed with the kindergarten test variables in order to assess the predictive effectiveness of the Jansky-de Hirsch Screening Index. Since this latter instrument was primarily developed for predicting students with potential reading and spelling difficulties, the CTBS data from the Capitalization, Punctuation and Usage subtests were not considered as important as the data from the Vocabulary, Comprehension and Spelling subtests.

The CTBS subtest means, standard deviations and grade equivalents for the 304 subjects are given in Table 4. The same data for the 155 male and 149 female subjects are found in Tables 5 and 6, respectively. Female students achieved higher mean scores than male students on all six CTBS subtests. The grade equivalent means ranged from 6.0 (Comprehension) to 6.3 (Spelling, Capitalization and Usage) for the former group and from 5.3 (Punctuation) to 5.8 (Vocabulary) for the latter group. The grade equivalent means for the 304 subjects showed little differentiation with a low of 5.8 on three subtests and a high of 6.0 on two subtests. All the CTBS subtest means for the male and female subjects and the total sample were considered above average on the CTBS 4M fall norms.

Canadian CTBS Percentiles

Canadian percentiles for the six CTBS subtest means were calculated not only for the total sample of 304 subjects (Table 7) but also for the 155 male and 149 female subjects (Table 8). Norms were obtained from the

CTBS Manual for Administrators, Supervisors and Counsellors (1975) and interpolation was used where necessary for missing percentiles.

All the Canadian percentiles for the CTBS subtest means were well above the national average, the majority of them exceeding the 80th percentile. The percentile scores for the total sample ranged from a low of 82 (Punctuation) to a high of 94 (Vocabulary). The female students achieved significantly higher percentiles (93 to 98) than the male pupils (62 to 90) and their scores tended to be much more homogeneous.

North Vancouver CTBS Percentiles

Since North Vancouver students usually achieve standardized test results well above the Canadian average, CTBS district percentiles were computed for the 304 subjects so that local and national norms could be compared. This comparison is important to note for school districts with standardized test means much above or below the national average. The difference between local and national norms can result in grading disparities; for example, some North Vancouver students have received average test marks on national norms but they have ranked well below average on district mean scores. This discrepancy in grading is sometimes overlooked by elementary and secondary teachers.

Two sets of comparisons between local and national CTBS percentile scores were calculated for the 304 subjects in this study. The first set of data consisted of computing Canadian and North Vancouver percentiles for the six CTBS subtest means (Table 7). District CTBS percentile averages were obtained from this analysis. The second set of data was obtained by finding the Canadian 50th percentile point for each CTBS subtest and then determining its equivalent North Vancouver percentile (Table 7). Interpolation was used where necessary for missing percentiles. District norms were acquired from the SPSS computer analysis; Canadian norms were obtained from the CTBS Manual for Administrators, Supervisors and Counsellors (1975).

Test of Written Spelling

The Test of Written Spelling and the Canadian Tests of Basic Skills were the two criterion spelling measures used in this study. The former instrument assesses spelling through means of an oral-dictation format while the latter instrument utilizes a multiple-choice format. Data on the CTBS spelling instrument have been provided in the previous section.

The TWS means, standard deviations and grade equivalents for the 155 male subjects and 149 female subjects are found in Tables 5 and 6, respectively. Table 4 lists the same data for the total group of 304 subjects. TWS percentile scores are given only for district norms as national percentile norms are not available in the TWS manual.

Grade equivalent means for the three TWS variables ranged as follows: 5.8 to 6.1 for the total group, 5.3 to 5.7 for the male group and 7.1 to 8.1 for the female group. The female students received significantly higher scores than the male students on the three TWS variables and the CTBS spelling subtest.

Watts Student Rating Scale

This instrument was developed by the researcher to provide a subjective measure for the predictor and criterion test variables. The

14-item five-point rating scale was completed by each subject's classroom teacher shortly after the administration of the CTBS and TWS subtests.

Little differentiation was found between the means and standard deviations of the WSRS individual variables (Table 9). The mean scores ranged from a low of 3.07 (Spelling) to a high of 3.33 (Reading Comprehension). Data on the correlation analysis will be presented in the second section of this chapter.

North Vancouver teachers with subjects in this study were asked to complete a short form asking if these students had difficulty in reading and/or spelling. The answer consisted of a simple "yes" or "no." The reported incidence for difficulty in reading was 16.7% compared to 19.74% difficulty in spelling.

Table 4

Raw Score Means, Grade Equivalents and
Standard Deviations for 304 Subjects on the
Canadian Tests of Basic Skills and the Test of Written Spelling

Variable	Raw Score Mean	Grade Equivalent	Standard Deviation
CTBS Subtests			
Vocabulary	23.53	6.0	8.64
Comprehension	42.77	5.8	12.49
Spelling	22.61	6.0	8.77
Capitalization	20.37	5.8	7.34
Punctuation	19.70	5.8	7.83
Usage	17.86	5.9	5.89
TWS Variables			
Predictable Words	29.27	6.1	4.67
Unpredictable Words	14.63	5.8	5.70
Total Score	43.90	5.9	9.94

Table 5

Raw Score Means, Grade Equivalents and
Standard Deviations for 155 Male Subjects on the
Canadian Tests of Basic Skills and the Test of Written Spelling

Variable	Raw Score Mean	Grade Equivalent	Standard Deviation
CTBS Subtests			
Vocabulary	21.95	5.8	8.67
Comprehension	39.23	5.5	13.07
Spelling	20.21	5.5	8.66
Capitalization	18.32	5.4	7.48
Punctuation	17.34	5.3	7.55
Usage	16.05	5.6	5.83
TWS Variables			
Predictable Words	27.96	5.7	5.31
Unpredictable Words	12.77	5.3	6.06
Total Score	40.73	5.5	10.91

Table 6

Raw Score Means, Grade Equivalents and
Standard Deviations for 149 Female Subjects on the
Canadian Tests of Basic Skills and the Test of Written Spelling

Variable	Raw Score Mean	Grade Equivalent	Standard Deviation
CTBS Subtests			
Vocabulary	25.16	6.1	8.34
Comprehension	46.46	6.0	10.70
Spelling	25.10	6.3	8.18
Capitalization	22.50	6.3	6.57
Punctuation	22.32	6.2	7.15
Usage	19.88	6.3	5.12
TWS Variables			
Predictable Words	30.62	8.1	3.40
Unpredictable Words	16.56	7.1	4.57
Total Score	47.19	7.1	7.55

Table 7

North Vancouver and Canadian Percentiles for 304 Subjects on the Canadian Tests of Basic Skills

Variable	Canadian Percentile	North Van. Percentile
Actual Scores		
Vocabulary	94	52
Comprehension	84	49
Spelling	87	53
Capitalization	89	50
Punctuation	82	52
Usage	92	47
Projected Scores		
Vocabulary	50	24
Comprehension	50	30
Spelling	50	34
Capitalization	50	33
Punctuation	50	37
Usage	50	30

Table 8

Canadian Percentiles for 155 Male and
149 Female Subjects on the Canadian Tests of Basic Skills

Variable	Male Percentile	Female Percentile
Vocabulary	90	97
Comprehension	70	93
Spelling	72	94
Capitalization	67	97
Punctuation	62	96
Usage	82	98

Table 9

Raw Score Means and Standard Deviations
for 304 Subjects on the Watts Student Rating Scale

Variable	Mean	S.D.
Reading Vocabulary	3.24	0.91
Word Analysis (decoding)	3.20	0.88
Sight Word Recognition	3.19	0.88
Oral Reading	3.20	0.83
Reading Comprehension	3.33	0.97
Punctuation Skills	3.10	0.92
Capitalization Skills	3.13	0.94
Grammatical Usage	3.10	0.84
Spelling	3.07	1.04
Oral Vocabulary	3.27	0.76
Works Independently	3.29	1.06
Concentrates on Assigned Tasks	3.24	1.09
Listens to Directions	3.26	1.02
Gets Along Socially with Peers	3.23	0.80

Learning Assistance Services

Two types of special education services, school-based and district-based, are available to North Vancouver students with learning problems. Background information on the subjects' involvement with one or both of these services was obtained from questionnaires and district records.

Learning assistance is the main school-based service given to pupils with academic difficulties. During May, all learning assistance centre (LAC) teachers involved in this study completed a LAC background questionnaire for subjects enrolled in their school. Information was requested only for those students who had received reading and/or spelling remediation. Although LAC records were available for most subjects participating in this study, some incomplete records were received from schools where LAC teachers had resigned or retired.

Data on learning assistance services are given in Tables A to D (Appendix D). A total of 86 subjects, 61 boys and 25 girls, received one or more years of LAC reading and/or spelling remediation by the end of their Grade Five school year. The percentage of subjects having learning assistance (Table A) ranged from a low of 9.82% in Grade One to a high of 18.12% in Grade Three ($\overline{X}$ = 14.10%). The significant chi-square suggests there is a statistically significant variation in numbers among the five grades ($x^2 = 12.53$, $\underline{df} = 4$, $\underline{p} < .05$). The LAC students in all grades were predominantly male (Table B). A chi-square analysis showed the number of pupils receiving LAC remediation from Grades One to Five was significantly higher for males compared to females. Most of the LAC pupils attended the LAC three or more times a week and the majority were given small group rather than individual remediation (Tables C and D).

District Special Education Services

North Vancouver School District provides a variety of district special education services for elementary students with moderate to severe learning difficulties. Three of the most commonly used services are: (1) a psychoeducational assessment by a school psychologist; (2) Orton-Gillingham tutoring; and (3) short-term placement at the district Diagnostic-Remediation Centre (D.C.1). North Vancouver special education records were used to determine the number of pupils receiving one or more of these three district services. All the assessed students had academic problems in reading and/or spelling.

Data pertaining to district special education services are provided in Tables E to I (Appendix D). Table E lists the number and percentage of subjects receiving district special education services between Grade One and Grade Five. Eighteen of the 19 assessed subjects were male. Nine of the assessed students received the following additional district services: tutoring and D.C.1 placement (four boys), tutoring only (one boy) and D.C.1 placement without tutoring (four boys).

Jansky-de Hirsch Screening Index scores for the 19 assessed pupils are given in Table F (raw scores) and Table G (converted scores). The Screening Index means for this group are listed in Tables H and I. With the exception of Picture Naming, all the subtest means for the assessed students were below the mean scores for the male and female groups and the total sample of 304 subjects.

t-Test and Correlation Analyses for Age

Pearson correlation coefficients and t-tests were computed to determine if there was a significant age difference in the predictor and criterion test scores. The subjects were divided into two age groups: older students who had birthdates on or before June 30, 1975 and younger students who had birthdates after that date.

The mean scores of the younger and older subjects did not differ significantly on most of the predictor and criterion test measures. The only significant age differences were as follows: (1) older subjects received higher mean scores on the raw and converted score Sentence Memory subtests; and (2) younger subjects had higher mean scores on the CTBS Spelling and TWS Predictable Words and Total Score variables.

Pearson correlation coefficients were computed between age and the predictor and criterion test variables. Significant intercorrelations between age and the Screening Index measures were low and ranged from .10 to .18. The TWS Predictable Words subtest had the only statistically significant Grade Five correlation with age (r = .11).

t-Test Analyses for Sex of Student

Test variance between male and female subjects was analyzed in order to examine the research hypotheses that girls would have significantly higher marks than boys at the kindergarten level but not at the fifth grade level. The t-test computations for sex of student are listed in Table 10 (predictor variables) and Table 11 (criterion variables). Boys differed significantly from girls on only four of the Jansky-de Hirsch Screening Index variables. The boys scored better on the converted and raw Picture Naming measures and the Screening Index total score while the girls had higher marks on the raw score Word Matching subtest. The statistical sex differentiation on the Screening Index total score may be partially or wholly due to the weighted conversion system designed by Jansky and de Hirsch. All the converted score subtests are weighted in favor of boys even if male and female students receive the same raw score on one or more subtests. The Screening Index total score means for male and female subjects were 60 and 57, respectively, with the maximum possible for this variable being 87 for male students and 81 for female students (Table 2).

Contrary to expectations, female pupils had significantly higher scores than male pupils on each of the nine criterion test variables. This disparity was more evident in the Test of Written Spelling than in the Canadian Tests of Basic Skills.

t-Test Analyses for Criterion Test Variables

The major purpose of this research study was to examine the predictive validity of the Jansky-de Hirsch Screening Index. Correlation analysis was utilized to compute the degree of relationship between the kindergarten and Grade Five measures and t-tests were used to check the statistical difference between the mean scores of the low-risk and high-risk subjects on the criterion test variables. The size of these criterion groups was determined by the number of low-risk and high-risk subjects on the 11 Screening Index variables. The two criterion groups for the t-test analyses were divided as follows: subjects with a Screening Index subtest score one standard deviation or more below the mean were classified as high-risk; all other subjects on that subtest were classified as low-risk. The one exception to the above criteria was the Screening Index total score where the North Vancouver district cut-off point was used. Students receiving total scores of 50 or less on the Screening Index were termed high-risk subjects; students receiving total scores higher than fifty were termed low-risk subjects.

The t-test results for the low-risk and high-risk groups on the criterion test variables are listed in Table 12 and Table 13. A total of 99 t-test analyses were computed on the criterion test variables to determine if there was a significant difference between the two groups based on the number of low-risk and high-risk subjects on each of the 11 Screening Index variables. A significant difference was found between the low-risk and high-risk students on all the CTBS subtests and most of the TWS variables. No significant differences were computed between the TWS Predictable Words groups when their size was based on the number of low-risk and high-risk subjects on the raw score Bender-Gestalt and the converted and raw score Picture Naming subtests. Non-significant t-values were also calculated for the TWS Unpredictable Words and Total Score variables when the size of their groups was determined by the number of low-risk and high-risk subjects on the converted score Picture Naming subtest.

Table 10

t-Values, Means and Standard Deviations for 155 Male and 149 Female Subjects on the Jansky-de Hirsch Screening Index

		Male Subjects		Female Subjects	
Variable	t-Value	Mean	S.D.	Mean	S.D.
Raw Scores					
Bender-Gestalt	-0.48	5.20	1.00	5.26	1.02
Word Matching	-2.27*	7.37	2.64	8.07	2.74
Letter Naming	-1.49	5.00	1.61	5.27	1.53
Picture Naming	4.17*	15.46	2.28	14.23	2.82
Sentence Memory	-0.88	2.00	0.66	2.07	0.66
Converted Scores					
Bender-Gestalt	1.56	11.98	3.50	11.37	3.34
Word Matching	-1.44	6.06	3.79	6.67	3.65
Letter Naming	-0.12	15.51	4.97	15.58	4.59
Picture Naming	7.21*	16.80	3.10	13.97	3.71
Sentence Memory	1.39	10.00	3.32	9.49	3.07
Total Index Score	2.47*	60.35	11.36	57.07	11.75

* $p < .05$

Table 11

t-Values, Means and Standard Deviations for
155 Male Subjects and 149 Female Subjects on the
Canadian Tests of Basic Skills and the Test of Written Spelling

		Male Subjects		Female Subjects	
Variable	t-Value	Mean**	S.D.	Mean**	S.D.
CTBS Subtests					
Vocabulary	-3.29*	21.95	8.67	25.16	8.34
Comprehension	-5.29*	39.23	13.07	46.46	10.70
Spelling	-5.06*	20.21	8.66	25.10	8.18
Capitalization	-5.16*	18.32	7.48	22.50	6.57
Punctuation	-5.89*	17.34	7.55	22.32	7.15
Usage	-6.06*	16.05	5.83	19.88	5.12
TWS Variables					
Predictable Words	-5.22*	27.96	5.31	30.62	3.40
Unpredictable Words	-6.18*	12.77	6.06	16.56	4.57
Total Score	-6.02*	40.73	10.91	47.19	7.55

* $p < .05$

** raw score means

Table 12

t-Values for Low-Risk and High-Risk Subjects on the Canadian Tests of Basic Skills and the Test of Written Spelling Using the Raw Score Screening Index Cut-Off Figures

	Jansky-de Hirsch Screening Index				
Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory
CTBS Subtests					
Vocabulary	-2.83	-4.85	-4.29	-3.88	-5.64
Comprehension	-2.86	-4.90	-5.28	-4.29	-4.40
Spelling	-3.33	-4.57	-4.88	-2.68	-3.66
Capitalization	-2.00	-4.87	-3.52	-2.98	-3.73
Punctuation	-2.81	-5.27	-3.38	-2.69	-4.07
Usage	-2.61	-4.21	-4.46	-2.52	-4.74
TWS Variables					
Predictable Words	-1.88*	-3.28	-3.91	-1.86*	-3.82
Unpredictable Words	-2.98	-4.37	-4.95	-2.60	-3.90
Total Score	-2.59	-4.20	-4.39	-2.37	-4.04

* $p > .05$

Table 13

t-Values for Low-Risk and High-Risk Subjects on the Canadian Tests of Basic Skills and the Test of Written Spelling Using the Converted Score Screening Index Cut-Off Figures

	Jansky-de Hirsch Screening Index					
Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory	Index Score
CTBS Subtests						
Vocabulary	-2.83	-4.66	-4.93	-3.46	-5.64	-7.96
Comprehension	-2.86	-4.71	-5.22	-3.81	-4.40	-7.12
Spelling	-3.33	-4.41	-5.17	-2.00	-3.66	-5.33
Capitalization	-2.00	-4.64	-3.71	-2.58	-3.73	-5.15
Punctuation	-2.81	-5.10	-3.55	-2.22	-4.07	-5.29
Usage	-2.61	-4.06	-4.07	-2.04	-4.74	-6.02
TWS Variables						
Predictable Words	-1.88 *	-3.43	-4.88	-1.00*	-3.82	-4.30
Unpredictable Words	-2.98	-4.09	-4.99	-1.77*	-3.90	-5.05
Total Score	-2.59	-3.96	-4.37	-1.48*	-4.04	-4.73

* $\underline{p} > .05$

Pearson Correlations for the Predictor Test Variables

Pearson correlation coefficients were computed for the 11 Jansky-de Hirsch Screening Index variables. The raw score subtests (Table 14) and the converted score subtests (Table 15) both had low positive correlations ranging from .12 to .34 for the former and from .12 to .36 for the latter. Intercorrelations for the raw and converted score measures are given in Table 14. Moderately high intercorrelations were found between the total Index Score and the subtests (.53 to .69). The five Jansky-de Hirsch subtests had an almost perfect relationship between the raw score and converted score variables (.98 to .99).

Pearson Correlations for the Predictor and Criterion Test Variables

The predictor and criterion subtest correlations are presented in Tables 16 to 19. Most of these intercorrelations were slightly higher when Screening Index raw scores (Tables 16 and 18) rather than converted scores (Tables 17 and 19) were used. Statistically significant kindergarten and Grade Five subtest correlations ranged from .12 to .38 for the raw scores and from .12 to .37 for the converted scores. Higher correlations were found between the criterion subtests and the Screening Index total score (.34 to .52). The lowest significant correlations were between the Picture Naming subtest and the Grade Five spelling measures (.12); the highest intercorrelations were between the Screening Index total score and the CTBS Comprehension and Vocabulary variables (.49 and .52, respectively).

The majority of the correlations between the Grade Five test measures and the Jansky-de Hirsch Diagnostic Battery were not significant. Only

15% of the Diagnostic Battery subtests and 17% of the Jansky-de Hirsch Student Rating Scale (JSRS) had significant correlations with the criterion test measures. The intercorrelations between the latter variables and the Jansky-de Hirsch Student Rating Scale were higher (.33 to .76) than those yielded by the Diagnostic Battery subtests (.23 to .34). Task Persistence, the sixth JSRS variable, was the only kindergarten test measure which correlated significantly with the majority of the criterion test variables. These significant correlations ranged from .37 to .55 on the CTBS and TWS subtests and from .39 to .76 on the Watts Student Rating Scale. The highest Diagnostic Battery correlations were computed between Task Persistence and two Watts SRS variables, Reading Vocabulary and Reading Comprehension (.76 and .63, respectively). Task Persistence was the only Diagnostic Battery variable which had significant correlations higher than .45 with the criterion test measures.

The Grade Five test variables included two objective measures, the CTBS and TWS subtests, and one subjective measure, the Watts Student Rating Scale (WSRS). Intercorrelations between the latter instrument and the Jansky-de Hirsch Screening Index are given in Table 18 (raw scores) and Table 19 (converted scores). Little difference was found between the Grade Five subjective and objective test correlations and the Screening Index variables. Intercorrelations between the Screening Index subtests and the Watts SRS were low but significant with a raw score range from .11 to .39 and a converted score range from .10 to .39. All the 14 Watts SRS measures yielded higher correlations with the Screening Index total score (.23 to .51) than with the Screening Index subtests (.10 to .39). The lowest correlations were computed between the Watts SRS and the Picture Naming and Sentence

Memory kindergarten subtests; the highest correlations were computed between the Screening Index total score and the WSRS comprehension measure (.51).

Pearson Correlations for the Criterion Test Variables

Pearson correlation coefficients were calculated for the three criterion instruments used in this study. All the Grade Five CTBS, TWS and Watts SRS variables correlated significantly with each other. The CTBS correlations ranged from a low of .55 to a high of .79 on the Vocabulary and Comprehension subtests (Table 20). The TWS variables yielded the following high correlations: .84 (Predictable Words and Unpredictable Words), .95 (Total Score and Predictable Words) and .97 (Total Score and Unpredictable Words). Intercorrelations between the Watts SRS variables were significant but widespread with a range of .38 to .94 (Table 21). The three highest WSRS correlations were as follows: .90 (Word Analysis and Sight Word Recognition), .92 (Works Independently and Concentrates on Assigned Tasks) and .94 (Punctuation and Capitalization).

Intercorrelations between the CTBS, TWS and WSRS variables are listed in Tables 20, 22 and 23. The CTBS and TWS measures had moderate to high correlations of .57 to .82. A strong relationship was evident between the multiple-choice CTBS spelling subtest and the three Test of Written Spelling variables (*r* = .72 to .82). The CTBS and TWS instruments had almost the same range of intercorrelations with the Watts Student Rating Scale (.33 to .76 and .31 to .73, respectively). Identical correlations were computed between most of the Watts SRS variables and the TWS Total Score and Unpredictable Words subtest; the Predictable Words subtest, however, yielded the lowest TWS and WSRS correlations.

Table 14

Pearson Correlation Coefficients for the Jansky-de Hirsch Screening Index (raw and converted score variables)

	Raw Scores				
Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory
Raw Scores					
Bender-Gestalt	-	.26	.18	.20	.12
Word Matching	.26	-	.25	.27	.14
Letter Naming	.18	.25	-	.28	.23
Picture Naming	.20	.27	.28	-	.34
Sentence Memory	.12	.14	.23	.34	-
Converted Scores					
Bender Gestalt	.98	.24	.16	.23	.11
Word Matching	.26	.99	.23	.26	.13
Letter Naming	.17	.25	.98	.31	.23
Picture Naming	.19	.23	.25	.98	.32
Sentence Memory	.10	.12	.22	.36	.99
Index Score	.53	.60	.66	.69	.54

$p < .04$ for all correlations

Table 15

Pearson Correlation Coefficients for the Jansky-de Hirsch Screening Index (converted score variables)

Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory	Index Score
Bender-Gestalt	-	.25	.17	.23	.12	.55
Word Matching	.25	-	.23	.24	.12	.60
Letter Naming	.17	.23	-	.28	.22	.69
Picture Naming	.23	.24	.28	-	.36	.67
Sentence Memory	.12	.12	.22	.36	-	.55
Index Score	.55	.60	.69	.67	.55	-

$p < .03$ for all correlations

Table 16

Pearson Correlation Coefficients for the Jansky-de Hirsch Screening Index (raw score variables) and the Canadian Tests of Basic Skills and the Test of Written Spelling

	Jansky-de Hirsch Screening Index				
Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory
CTBS Subtests					
Vocabulary	.29	.36	.35	.36	.36
Comprehension	.31	.37	.37	.32	.32
Spelling	.30	.32	.35	.17	.21
Capitalization	.23	.32	.26	.21	.18
Punctuation	.26	.38	.27	.20	.22
Usage	.25	.32	.33	.21	.32
TWS Variables					
Predictable Words	.27	.25	.38	.09*	.22
Unpredictable Words	.29	.30	.36	.12	.23
Total Score	.29	.29	.38	.12	.23

$p < .002$ for all Screening Index and CTBS correlations

$p < .03$ for all Screening Index and TWS correlations except for * correlation

* $p > .05$

Table 17

Pearson Correlation Coefficients for the Jansky-de Hirsch Screening Index (converted score variables) and the Canadian Tests of Basic Skills and the Test of Written Spelling

	Jansky-de Hirsch Screening Index					
Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory	Index Score
CTBS Subtests						
Vocabulary	.26	.35	.35	.31	.33	.52
Comprehension	.27	.35	.35	.26	.28	.49
Spelling	.27	.32	.35	.12	.17	.41
Capitalization	.18	.32	.24	.16	.14	.34
Punctuation	.22	.37	.26	.14	.18	.38
Usage	.21	.31	.31	.15	.28	.41
TWS Variables						
Predictable Words	.23	.24	.37	.05*	.18	.36
Unpredictable Words	.25	.29	.35	.06*	.18	.38
Total Score	.25	.28	.38	.06*	.19	.39

$\underline{p} < .002$ for all Screening Index and CTBS correlations

$\underline{p} < .03$ for all Screening Index and TWS correlations except for * correlations

* $\underline{p} > .05$

Table 18

Pearson Correlation Coefficients for the Jansky-de Hirsch Screening Index (raw score variables) and the Watts Student Rating Scale

	Jansky-de Hirsch Screening Index				
WSRS Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory
Reading Vocabulary	.33	.39	.36	.29	.29
Word Analysis	.33	.33	.38	.27	.26
Sight Word Recognition	.33	.34	.34	.23	.24
Oral Reading	.35	.39	.32	.25	.23
Reading Comprehension	.34	.39	.37	.29	.32
Punctuation Skills	.28	.29	.26	.09*	.16
Capitalization Skills	.28	.29	.26	.11	.17
Grammatical Usage	.32	.32	.30	.15	.22
Spelling	.32	.29	.27	.15	.18
Oral Vocabulary	.28	.32	.30	.28	.23
Works Independently	.21	.24	.26	.09*	.20
Concentrates on Assigned Task	.22	.25	.23	.03*	.14
Listens to Directions	.28	.27	.23	.13	.16
Peer Socialization	.24	.22	.21	.21	.20

$\underline{p} < .04$ for all correlations except for * correlations

* $\underline{p} > .05$

Table 19

Pearson Correlation Coefficients for the Jansky-de Hirsch Screening Index (converted score variables) and the Watts Student Rating Scale

	Jansky-de Hirsch Screening Index					
WSRS Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory	Index Score
Reading Vocabulary	.30	.37	.37	.24	.25	.50
Word Analysis	.30	.31	.39	.22	.23	.48
Sight Word Recognition	.30	.32	.34	.18	.21	.45
Oral Reading	.32	.38	.32	.19	.18	.46
Reading Comprehension	.32	.37	.36	.24	.28	.51
Punctuation Skills	.23	.28	.26	.03*	.12	.31
Capitalization Skills	.23	.28	.25	.05*	.12	.31
Usage	.29	.30	.30	.10	.18	.39
Spelling	.29	.29	.27	.10	.14	.36
Oral Vocabulary	.25	.30	.30	.23	.20	.42
Works Independently	.18	.23	.23	.03*	.16	.27
Concentrates on Assigned Task	.18	.24	.21	-.02*	.10	.23
Listens to Directions	.23	.25	.22	.06*	.12	.29
Peer Socialization	.20	.22	.21	.16	.17	.32

$p < .05$ for all correlations except for * correlations

* $p > .05$

Table 20

Pearson Correlation Coefficients for the
Canadian Tests of Basic Skills and the Test of Written Spelling

	Canadian Tests of Basic Skills					
Variable	Vocabulary	Comprehension	Spelling	Capitalization	Punctuation	Usage
CTBS Subtests						
Vocabulary	-	.79	.66	.59	.63	.68
Comprehension	.79	-	.67	.64	.67	.67
Spelling	.66	.67	-	.65	.71	.60
Capitalization	.60	.64	.65	-	.73	.55
Punctuation	.63	.67	.71	.73	-	.64
Usage	.68	.67	.60	.55	.64	-
TWS Variables						
Predictable Words	.59	.61	.72	.57	.61	.65
Unpredictable Words	.64	.66	.82	.62	.67	.63
Total Score	.64	.66	.81	.62	.67	.67

$\underline{p} < .001$ for all correlations

Table 21

Pearson Correlation Coefficients for the Watts Student Rating Scale

Variable	1	2	3	4	5	6	7
1. Reading Vocabulary	-	.89	.89	.77	.86	.71	.71
2. Word Analysis	.89	-	.90	.77	.83	.73	.73
3. Sight Word Recognition	.89	.90	-	.83	.85	.72	.72
4. Oral Reading	.77	.77	.83	-	.79	.66	.68
5. Reading Comprehension	.86	.83	.85	.79	-	.71	.70
6. Punctuation Skills	.71	.73	.72	.66	.71	-	.94
7. Capitalization Skills	.71	.73	.72	.68	.70	.94	-
8. Usage	.76	.77	.76	.71	.71	.82	.82
9. Spelling	.72	.74	.74	.70	.70	.78	.79
10. Oral Vocabulary	.77	.76	.78	.74	.74	.64	.63
11. Works Independently	.60	.62	.61	.57	.64	.66	.64
12. Concentrates on Assigned Task	.58	.60	.57	.56	.62	.64	.63
13. Listens to Directions	.59	.58	.58	.57	.62	.65	.63
14. Peer Socialization	.46	.46	.45	.49	.45	.42	.42

Continued ...

Table 21 (continued)

Variable	8	9	10	11	12	13	14
1. Reading Vocabulary	.76	.72	.77	.60	.58	.59	.46
2. Word Analysis	.77	.74	.76	.62	.60	.58	.46
3. Sight Word Recognition	.76	.74	.78	.61	.57	.58	.45
4. Oral Reading	.71	.70	.74	.57	.56	.57	.49
5. Reading Comprehension	.71	.70	.74	.64	.62	.62	.45
6. Punctuation Skills	.82	.78	.64	.66	.64	.65	.42
7. Capitalization Skills	.82	.79	.63	.64	.63	.63	.42
8. Usage	-	.76	.73	.59	.57	.58	.45
9. Spelling	.76	-	.67	.62	.60	.60	.38
10. Oral Vocabulary	.73	.67	-	.52	.49	.51	.43
11. Works Independently	.59	.62	.52	-	.92	.85	.58
12. Concentrates on Assigned Task	.57	.60	.49	.92	-	.88	.57
13. Listens to Directions	.58	.60	.51	.85	.88	-	.61
14. Peer Socialization	.45	.38	.43	.58	.57	.61	-

p <.001 for all correlations

Table 22

Pearson Correlation Coefficients for the Canadian Tests of Basic Skills and the Watts Student Rating Scale

	Canadian Tests of Basic Skills					
WSRS Variable	Vocabulary	Comprehension	Spelling	Capitalization	Punctuation	Usage
Reading Vocabulary	.72	.76	.65	.61	.64	.61
Word Analysis	.68	.72	.65	.59	.62	.59
Sight Word Recognition	.70	.72	.66	.61	.63	.59
Oral Reading	.64	.64	.63	.58	.60	.56
Reading Comprehension	.68	.71	.63	.58	.62	.56
Punctuation Skills	.57	.62	.62	.60	.65	.50
Capitalization Skills	.58	.62	.62	.61	.65	.51
Usage	.61	.64	.61	.60	.61	.51
Spelling	.58	.60	.72	.61	.63	.54
Oral Vocabulary	.62	.64	.60	.51	.55	.51
Works Independently	.50	.54	.53	.50	.55	.46
Concentrates on Assigned Task	.48	.51	.54	.49	.55	.42
Listens to Directions	.49	.50	.50	.48	.54	.44
Peer Socialization	.38	.40	.35	.35	.35	.33

$\underline{p} < .001$ for all correlations

Table 23

Pearson Correlation Coefficients for the Test of Written Spelling and the Watts Student Rating Scale

	Test of Written Spelling		
WSRS Variable	Predictable Words	Unpredictable Words	Total Score
Reading Vocabulary	.63	.70	.70
Word Analysis	.62	.68	.68
Sight Word Recognition	.63	.67	.69
Oral Reading	.56	.61	.61
Reading Comprehension	.59	.65	.65
Punctuation Skills	.57	.63	.63
Capitalization Skills	.58	.64	.64
Usage	.56	.62	.62
Spelling	.66	.73	.73
Oral Vocabulary	.54	.58	.58
Works Independently	.47	.54	.53
Concentrates on Assigned Task	.46	.54	.52
Listens to Directions	.45	.52	.51
Peer Socialization	.31	.34	.34

$\underline{p} < .001$ for all correlations

Multiple Regression Analysis

A stepwise multiple regression procedure was used to determine which combination of independent variables best predicted the dependent test results. The independent kindergarten variables included sex of student and the raw and converted score Screening Index measures; the Grade Five dependent variables consisted of the CTBS subtests and TWS measures. A total of 11 independent variables were utilized to predict each of the dependent test outcomes.

The results of the multiple regression analyses are listed in Tables J to R (Appendix D). Each of the nine tables presents the following regression data: R square, constant, F ratio and Beta (the unstandardized regression coefficient). Data for the raw score and converted score independent variables are given in the same table to allow for ease of comparison.

Prediction of Kindergarten Variables to CTBS Vocabulary Subtest

The multiple regression data for the kindergarten variables to the CTBS Vocabulary test scores are presented in Table J. Although the total R squares for the raw and converted scores were almost identical (0.340 and 0.347, respectively) the rank order of the variables differed considerably between the two sections. The three most predictive raw score variables were Picture Naming, Sex of Student and Word Matching; the three most predictive converted score subtests were Letter Naming, Word Matching and Sentence Memory.

Prediction of Kindergarten Variables to CTBS Comprehension Subtest

The independent variables accounted for 0.377 of the variance in the CTBS Comprehension scores (Table K). The first kindergarten measure to enter the two Comprehension regression models was Letter Naming followed by Word Matching and Sex of Student in the raw score section and Sex of Student and Picture Naming in the converted score section.

Prediction of Kindergarten Variables to CTBS Spelling Subtest

Table L lists the regression data for the kindergarten variables to the CTBS Spelling measure. The predictive order of the raw and converted score variables was exactly the same with Letter Naming first followed by Sex of Student and Bender-Gestalt. The total R square for the converted scores was 0.297, slightly higher than the combined R square of 0.285 for the raw score variables.

Prediction of Kindergarten Variables to CTBS Capitalization Subtest

The Screening Index raw scores and Sex of Student accounted for 0.235 of the variance in the CTBS Capitalization subtest results (Table M). An almost identical proportion of variance was computed for the Screening Index converted scores and Sex of Student (0.236). Both regression models in this table had the same ranking of independent variables; Word Matching was the most predictive subtest and Sex of Student and Picture Naming were the second and third most predictive kindergarten variables.

Prediction of Kindergarten Variables to CTBS Punctuation Subtest

Multiple regression data for the 11 independent variables to the CTBS Punctuation subtest are given in Table N. The R square for the raw score measures was 0.296, slightly lower than the R square of 0.303 for the converted square measures. The CTBS Capitalization and Punctuation subtests had the same predictive order of kindergarten variables.

Prediction of Kindergarten Variables to CTBS Usage Subtest

The proportion of variance for the CTBS Usage subtest was 0.324 and 0.330, respectively, for the kindergarten raw score and converted score measures (Table O). Sex of Student, Sentence Memory and Letter Naming were the three most predictive raw score variables; Sex of Student, Letter Naming and Sentence Memory were the three most predictive converted score variables.

Prediction of Kindergarten Variables to TWS Predictive Words Subtest

Table P gives the regression data for the kindergarten measures to the TWS Predictive Words subtest. Both regression models in this table had the same predictive order of independent variables with Letter Naming being the first entry followed by Sex of Student and Bender-Gestalt. The R square for the raw score measures (0.270) was almost identical to the R square for the converted score measures (0.276).

Prediction of Kindergarten Variables to TWS Unpredictable Words Subtest

The independent raw score measures accounted for 0.305 of the variance in the TWS Unpredictable Words subtest results (Table Q). A slightly higher proportion of variance (0.315) was computed for the kindergarten converted score measures. The raw score and converted score variables had the same order of entry into the two regression models and the three most predictive variables were as follows: (1) Letter Naming; (2) Sex of Student; and (3) Bender-Gestalt.

Prediction of Kindergarten Variables to TWS Total Score

Multiple regression data for the independent variables to the TWS total score are listed in Table R. The R square for the raw score measures was 0.313, slightly lower than the R square of 0.322 for the converted score measures. Letter Naming was the first kindergarten measure to enter the two regression models in this table and Sex of Student and Bender-Gestalt were the second and third variables, respectively.

Summary

The multiple regression analyses produced R square values which usually yielded little difference between the amount of variance for the raw score and the converted score kindergarten subtests. The three kindergarten variables which contributed the highest amount of variance to the Grade Five test measures were in order: (1) Letter Naming; (2) Sex of Student; and (3) Word Matching. None of the independent variables yielded high R square values with the dependent test measures.

Factor Analysis of the Criterion Test Variables

A principal components factoring without iterations was computed on the criterion test variables (Table S, Appendix D). The CTBS and TWS subtest measures yielded one definite factor and this factor was included in the predictive validity analysis which is listed in the next section of this chapter.

Predictive Validity of the Study

One of the major purposes of this follow-up study was to check the predictive validity of the Jansky-de Hirsch Screening Index. The 304 subjects were divided into low-risk and high-risk groups on the basis of their kindergarten and Grade Five test scores. Subjects receiving a total score of 50 or below on the Screening Index were termed high-risk kindergarten students; subjects receiving Screening Index total scores in excess of 50 were classified as low-risk students. The high-risk and low-risk groups for each of the CTBS and TWS variables were determined by using a score of one standard deviation below the mean as the cut-off point for the two Grade Five groups.

The predictive utility of the Screening Index was calculated by matching the two kindergarten groups with the two Grade Five groups for each CTBS and TWS variable. The 304 subjects were classified under one of four classifications. The two correctly predicted groups consisted of true positive (high-risk in both kindergarten and Grade Five) and true negative (low-risk in both kindergarten and Grade Five). The two incorrectly predicted groups were false positive (high-risk in kindergarten but low-risk in Grade Five and false negative (low-risk in kindergarten but high-risk in Grade Five).

Table 24 lists the number and percentage of Grade Five subjects grouped under the four classifications. A summary of this data is given in Table 25. The predictive validity of the Screening Index total score ranged from a low of 74.26% on the CTBS Punctuation variable to a high of 79.93% on the CTBS Vocabulary subtest. The hit rate for the CTBS Comprehension subtest was 78.62% followed by the factor's hit rate of 78.29%.

Early identification researchers tend to be divided on the advantages and disadvantages of false positive and false negative students. Background information on this topic was presented in Chapter One. A larger percentage of incorrectly classified subjects in this study were grouped as false positive students rather than false negative students. This researcher tends to agree with Jansky and de Hirsch (1972) that overprediction of high-risk kindergarten pupils is generally better than underprediction as long as the screening instrument results are used only as an alert and not for labelling students. The change in grouping from high-risk at kindergarten to low-risk in Grade Five may be partially due to the fact that North Vancouver schools give learning assistance priority to primary children with reading difficulty.

The Screening Index battery developed by Jansky and de Hirsch in 1972 was designed for the prediction of future reading and spelling achievement. The percentage of correctly predicted students for the two CTBS reading tests (Vocabulary and Comprehension) averaged 79.11%. The hit rate for the CTBS and TWS spelling measures was slightly lower with an average of 76.65%. In summary, these percentages represented correct reading and spelling placement for almost four out of five students in this study.

Table 24

Predictive Classification of Grade Five Test Achievement for 304 Subjects Based on their Total Score on the Jansky-de Hirsch Screening Index (number and percentage given for each group)

Variable	True Positive	True Negative	False Positive	False Negative
Factor	28 (09.21%)	210 (69.08%)	41 (13.49%)	25 (08.22%)
CTBS Vocabulary	28 (09.21%)	215 (70.72%)	41 (13.49%)	20 (06.58%)
CTBS Comprehension	27 (09.88%)	212 (69.74%)	42 (13.82%)	23 (07.57%)
CTBS Spelling	23 (07.57%)	210 (69.08%)	46 (15.13%)	25 (08.22%)
CTBS Capitalization	23 (07.57%)	206 (67.76%)	46 (15.13%)	29 (09.54%)
CTBS Punctuation*	25 (08.22%)	200 (65.79%)	44 (14.47%)	34 (11.18%)
CTBS Usage*	28 (09.21%)	201 (66.12%)	41 (13.49%)	33 (10.86%)
TWS Predictable Words	19 (06.25%)	211 (69.41%)	50 (16.45%)	24 (07.89%)
TWS Unpredictable Words	25 (08.22%)	212 (69.74%)	44 (14.47%)	23 (07.57%)
TWS Total Score	23 (07.57%)	209 (68.75%)	46 (15.13%)	26 (08.55%)

* n = 303 subjects

Table 25

Summary Table of Predictive Classification of Grade Five Test Achievement for 304 Subjects Based on their Total Score on the Jansky-de Hirsch Screening Index (number and percentage given for each group)

Variable	Correct Negative or Positive Classification	Incorrect Positive Classification	Incorrect Negative Classification
Factor	238/304 (78.29%)	41/69 (59.42%)	25/235 (10.64%)
CTBS Vocabulary	243/304 (79.93%)	41/69 (59.42%)	20/235 (08.51%)
CTBS Comprehension	239/304 (78.62%)	42/69 (60.87%)	23/235 (09.79%)
CTBS Spelling	233/304 (76.64%)	46/69 (66.66%)	25/235 (10.65%)
CTBS Capitalization	229/304 (75.33%)	46/69 (66.66%)	29/235 (12.34%)
CTBS Punctuation*	225/304 (74.26%)	44/69 (63.77%)	34/235 (14.47%)
CTBS Usage*	229/304 (75.58%)	41/69 (59.42%)	33/235 (14.04%)
TWS Predictable Words	230/304 (75.66%)	50/69 (72.46%)	24/235 (10.21%)
TWS Unpredictable Words	237/304 (77.96%)	44/69 (63.77%)	23/235 (09.79%)
TWS Total Score	232/304 (76.32%)	46/69 (66.66%)	26/235 (11.06%)

* n = 303 subjects

CHAPTER FIVE

Summary of the Study

Chapter Five is divided into four major sections. The first section gives an overview of the study and the second section summarizes and discusses the results of the statistical analyses presented in the previous chapter. The third section lists a number of recommendations arising from the study and the fourth section provides a final summation.

Overview of the Study

The Jansky-de Hirsch Screening Index is the major kindergarten screening battery used in North Vancouver School District. A five-year follow-up study of this instrument was initiated by this researcher. The major purpose of this correlational study was to assess the predictive effectiveness of the Screening Index with North Vancouver students and to collect and analyze information on a number of predictor and criterion variables.

A total of 304 subjects, 155 males and 149 females, took part in the study. These subjects were randomly selected from 756 Grade Five students who had been given the Jansky-de Hirsch screening battery in their 1975-1976 kindergarten year. Twenty-eight of the 31 elementary schools in North Vancouver agreed to participate in the study.

Thirty predictor and 43 criterion variables were used for the data analysis. The predictor instruments consisted of the Jansky-de Hirsch Screening Index and the Diagnostic Battery. The latter instrument was administered to kindergarten students who received a total score of 50 or less on the Screening Index. Age and sex of subjects were also included as predictor variables.

The three criterion instruments were composed of two standardized instruments, the Canadian Tests of Basic Skills and the Test of Written Spelling, and one student rating scale developed by the researcher. Learning assistance teachers in the 28 schools administered the first two instruments in October and November and the subjects' classroom teachers completed the student rating scales early in December.

The 43 criterion variables consisted of the three criterion instruments plus background data on the subjects' involvement with school and district special education services. Information was gathered for subjects receiving learning assistance remediation between Grades One and Five. Special education files at the North Vancouver School Board were used to find out which of the subjects had been given one or more of the following district special education services: psychoeducational assessment, Orton-Gillingham tutoring or placement at the Diagnostic-Remediation Centre. Since Jansky and de Hirsch developed their Screening Index primarily as a predictive instrument for reading and/or spelling difficulties, school and district special education data were collected only for subjects who had problems in one or both of these academic subjects.

Approximately 18,000 scores were recorded and coded for this follow-up study. These variables were statistically analyzed through use of a SPSS computer program at the University of British Columbia's Computing Centre. The major descriptive and inferential statistical procedures used in the research included t-test, correlation, factor and multiple regression analyses. Means and standard deviations were computed for most variables. The predictive validity of the Jansky-de Hirsch Screening Index was assessed by matching the low-risk and high-risk subjects on the predictor and criterion test variables. The percentage of correctly and incorrectly classified subjects formed the predictive effectiveness or hit rate of this study.

Summary and Discussion of the Research Data

This section lists the hypotheses researched in the study and summarizes the results of the data analyses used for these hypotheses. A brief discussion of the important research findings found in the study follows the information on the hypotheses.

Hypothesis One

No significant difference exists between the mean scores of the younger and older subjects on the Jansky-de Hirsch Screening Index.

Summary

This hypothesis was accepted for all Screening Index variables except Sentence Memory. The mean scores of the younger subjects were significantly lower than the mean scores of the older subjects on the Sentence Memory raw and converted score subtests. No significant age difference was found on nine of the 11 Screening Index variables.

Hypothesis Two

No significant difference exists between the mean scores of the younger and older subjects on the Canadian Tests of Basic Skills and the Test of Written Spelling.

Summary

This hypothesis was accepted for six out of nine CTBS and TWS variables. The younger subjects had significantly higher mean scores on the following three measures: CTBS Spelling and TWS Predictable Words and Total Score variables. The mean scores of the younger and older subjects did not show any significant difference on the remaining CTBS and TWS measures.

Hypothesis Three

A significant difference exists between the mean scores of the male and female subjects on the Jansky-de Hirsch Screening Index.

Summary

No significant difference was found between the mean scores of the male and female subjects on seven of the 11 Screening Index variables. The male subjects had significantly higher mean scores on the Screening Index Total Score and the raw and converted score Picture Naming subtests (Table 10). The mean scores of the female subjects were significantly higher on only one Screening Index variable, the raw score Word Matching subtest.

Hypothesis Four

No significant difference exists between the mean scores of the male and female subjects on the Canadian Tests of Basic Skills and the Test of Written Spelling.

Summary

This hypothesis was rejected for all the variables on the Canadian Tests of Basic Skills and the Test of Written Spelling. The female subjects had significantly higher mean scores than the male subjects on the six CTBS subtests and the three TWS measures (Table 11).

Hypothesis Five

A significant difference exists between the mean scores of the low-risk and high-risk subjects on the Canadian Tests of Basic Skills.

Summary

A significant difference was found between the mean scores of the low-risk and high-risk subjects on all the Canadian Tests of Basic Skills variables. The number of subjects in these two criterion groups was based on the number of low-risk and high-risk subjects on each of the Screening Index variables. A total of 66 significant t-values were calculated to check this hypothesis (Tables 12 and 13).

Hypothesis Six

A significant difference exists between the mean scores of the low-risk and high-risk subjects on the Test of Written Spelling.

Summary

A significant difference was found between the mean scores of the low-risk and high-risk subjects on 27 of the 33 t-tests used to check this hypothesis (Tables 12 and 13). The size of these groups was determined by the number of low-risk and high-risk subjects on the 11 Screening Index variables. No significant differences were computed between the TWS Predictable Words groups when their size was based on the number of low-risk and high-risk subjects on the raw score Bender-Gestalt and the converted and raw score Picture Naming subtests. Non-significant t-values were also calculated for the TWS Unpredictable Words and Total Score variables when the size of their groups was determined by the number of low-risk and high-risk subjects on the converted score Picture Naming subtest.

Hypothesis Seven

The Jansky-de Hirsch Screening Index total score will predict the low-risk and high-risk subjects on the Canadian Tests of Basic Skills.

Summary

The predictive accuracy of the Screening Index total score ranged from 74.26% to 79.93% on the CTBS variables (Table 25). The hit rate for the CTBS Vocabulary and Comprehension subtests averaged 79.11%.

Hypothesis Eight

The Jansky-de Hirsch Screening Index total score will predict the low-risk and high-risk subjects on the Test of Written Spelling.

Summary

The predictive effectiveness of the Screening Index total score ranged from 75.66% to 77.96% on the three Test of Written Spelling variables (Table 25). The average hit rate for these three spelling measures was 76.65%. The Screening Index total score incorrectly predicted more false positive subjects than false negative subjects on all the CTBS and TWS variables (Table 24).

Hypothesis Nine

A significant correlation exists between the raw score and converted score subtests on the Jansky-de Hirsch Screening Index.

Summary

A significant and strong correlation was found between the raw score and converted score variables for each of the Screening Index subtests. The raw and converted score measures for each subtest had an almost perfect relationship. Intercorrelations of .98 were computed between the raw score and converted score Bender-Gestalt, Letter Naming and Picture Naming subtests. The Word Matching and Sentence Memory subtests had correlations of .99 between each of their raw and converted score measures (Table 14).

Hypothesis Ten

A significant correlation exists between the spelling variables on the Canadian Tests of Basic Skills and the Test of Written Spelling.

Summary

The multiple-choice CTBS spelling subtest and the oral-dictation TWS variables had a significant and strong relationship. Significant intercorrelations of .72, .81 and .82 were computed between the CTBS and TWS variables (Table 20).

One of the main purposes of this follow-up study was the collection and analysis of data which would prove useful to North Vancouver teachers and administrators. During the past ten years, thousands of North Vancouver kindergarten students have been given the Jansky-de Hirsch Screening Index and (if their scores warranted it) the more detailed Diagnostic Battery. The results of this assessment program are used to alert kindergarten and learning assistance teachers to children who may be high-risk students for future reading and spelling difficulties. North Vancouver's kindergarten program incorporates three main components: screening, diagnosis and intervention. The test results from the Screening Index play an important role in determining whether a kindergarten child should have additional assessment and assistance. Most North Vancouver kindergarten teachers utilize a locally-developed intervention booklet which gives numerous teaching strategies for children who have difficulty on the Jansky-de Hirsch batteries. Decisions concerning assessment and intervention must be based on instruments which have as much validity and reliability as possible. This longitudinal study has clarified some of the major early identification issues which have been discussed and debated for many years in North Vancouver schools.

Data analyses of the variables revealed a number of interesting research findings. Contrary to expectations, no significant difference was found between the mean scores of the male and female subjects on most of the kindergarten test variables. The girls, however, had significantly higher mean scores than the boys on all the Grade Five CTBS and TWS test variables. These findings may reflect a number of factors in our changing society such as an increased awareness of early childhood sex stereotyping and the growing popularity of educational television programs.

Age was not a significant variable on most of the predictor and criterion test measures. This fact is difficult for many kindergarten teachers to accept as many immature students seem to have birthdates in the latter months of the year. Although some younger kindergarten children progress slowly in comparison to their classmates, many younger children have little, if any, difficulty coping with the kindergarten curriculum.

A large number of North Vancouver subjects in this study received one or more years of learning assistance for reading and/or spelling difficulties. A total of 86 students (28% of the sample) had been given one or more years of LAC remediation by the end of their Grade

Five school year. Most of these LAC students were male. The percentage of subjects receiving learning assistance ranged from a low of 10% in Grade One to a high of 18% in Grade Three ($\overline{X}$ = 14.10%). These LAC percentages would probably be somewhat changed if learning assistance data were being collected in 1984. During the past few years, North Vancouver LAC teachers have placed more emphasis on working with primary children at the kindergarten and Grade One levels.

The results of the t-test analyses are summarized under six of the ten hypotheses listed in this chapter. Mean scores on the 11 Screening Index measures significantly predicted the low-risk and high-risk subjects on all the CTBS subtests and most of the TWS variables. Correct predictions were found for 93 of the 99 t-test analyses on the predictor and criterion test variables (Tables 12 and 13).

Pearson correlation coefficients were computed for most of the variables in this study. The majority of these correlations were significant but the relationship between most variables was low to moderate. The highest predictor correlations were found between the raw score and converted score measures of each of the Screening Index subtests (.98 to .99). The highest significant correlation between the predictor and criterion test measures was .52 (Screening Index Total Score and the CTBS Vocabulary Measure). The intercorrelations between the criterion test variables were moderate to high, most of these correlations being in the .5 to .8 range.

The multiple regression analysis revealed the amount of variance the independent test measures contributed to the dependent CTBS and TWS scores. The total R squares for the raw and converted scores were almost identical for each of the dependent variables. The four independent spelling measures had the same rank order of dependent variables: (1) Letter Naming; (2) Sex of Student; and (3) Bender-Gestalt. Letter Naming also provided the greatest proportion of variance to the CTBS Vocabulary and Comprehension converted score measures. The rank order of the independent measures altered considerably on most of the dependent variables. The highest amount of variance was computed on the CTBS Comprehension subtest (0.377). The greatest proportion of variance on the 1972 Jansky-de Hirsch two-year follow-up study was 0.420.

The predictive validity of this follow-up study was calculated by matching the low-risk and high-risk subjects on the kindergarten test variables with the low-risk and high-risk subjects on the criterion test measures. The hit rate for these nine latter variables ranged from 74.26% to 79.93%. The CTBS Vocabulary and Comprehension subtests were considered the most important criterion test measures and the percentages of correctly classified subjects on these two variables were 79.93% and 78.62%, respectively. The predictive effectiveness of this five-year follow-up study averaged 78.29% with slightly higher percentages for the two reading variables. Almost four out of five of the subjects in this study were correctly classified on the basis of their Jansky-de Hirsch Screening Index Total Score.

Recommendations Arising from the Study

A number of recommendations are stated which apply specifically to this study. These recommendations are listed in point form.

(1) A summary of the major research findings in this study should

be compiled for use by kindergarten teachers, LAC teachers, school administrators and pertinent school district personnel.

(2) District norms should be developed for the Jansky-de Hirsch Screening Index variables.

(3) A possible change should be considered in the Screening Index cut-off score. A slight lowering of the present cut-off score would decrease the number of false positive subjects.

(4) Some form of teacher rating scale or questionnaire should be considered as an integral part of the kindergarten screening program.

(5) Teachers should be made more aware of the discrepancy between district and national norms on Canadian standardized instruments.

(6) A detailed study should be undertaken of the false positive subjects in this study. A large number of Grade Five students were classified as high-risk on the Screening Index variables but were reclassified as low-risk on one or more of the CTBS and TWS variables. A detailed study of these students may explain some of the reasons for their change in classification.

(7) Additional cross-validational studies should be undertaken by other school districts to check the predictive effectiveness of the Jansky-de Hirsch kindergarten battery.

Summary

Although the data in this research study has provided support for the predictive accuracy of the Jansky-de Hirsch Screening Index, a number of important points need to be noted regarding early identification assessment. The growing popularity of kindergarten screening programs is evident throughout North America; misuse of these instruments, however, is also evident. Some educators use screening results for placement decisions concerning promotion or retention while others utilize screening data for labelling and classifying students. Teachers must be aware that a test is only one sample of behavior. Children go through many developmental stages as they progress through school and educators cannot hope to assess this maturation during a short assessment period. Screening instruments can provide useful information for kindergarten teachers as long as they are used only for screening, not for labelling.

Some educators question the use of early identification batteries as they feel teacher judgment is the best tool for predicting those children who may experience future learning difficulties. During the past few years, a large number of researchers have studied teacher evaluation of low-risk and high-risk kindergarten children. Most experienced kindergarten teachers are well aware of the strengths and maturational levels of their pupils. A number of researchers, however, have cautioned educators not to use teacher evaluation as their only source of kindergarten screening but rather to combine teacher assessment with some form of well-designed early identification battery (Jansky & de Hirsch, 1972; Becker & Snider, 1979).

Kindergarten screening is not a precise or exact science (Barnes, 1982). The predictive accuracy of an early identification battery is dependent not only on good validity and reliability but also on many interwoven factors which constantly influence the child. Environmental, behavioral, maturational and educational factors all play an important role in the development of a child's abilities, interests and personality. Barnes, in his 1982 book on preschool screening, stated that a 75% prediction accuracy rate is the highest percentage educators can hope to obtain when using a kindergarten screening instrument. Given the complexity of the field, it seems inevitable that early identification researchers cannot hope to develop perfect prediction batteries but rather must work towards designing effective screening instruments which have been carefully constructed and normed. It is hoped that this five-year follow-up study has contributed pertinent research data not only to North Vancouver educators but also to other similar school districts using the Jansky-de Hirsch screening battery.

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APPENDIX A

Written Communication Concerning the Study

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: ALL ELEMENTARY PRINCIPALS

FROM: L.G. MARSHALL

DATE: August 25, 1980

In the fall of 1980, Rochelle Watts, Learning Assistance Consultant, will be doing a five-year follow-up study of the Jansky-de Hirsch kindergarten screening program. This study will form the basis for her M.A. thesis in Special Education at UBC.

The Grade Five follow-up assessment will consist of the following measures:

1. Six subtests from the Canadian Tests of Basic Skills (CTBS)
    - Test V (Vocabulary)
    - Test R (Reading Comprehension)
    - Test L (Language Skills)
2. The Larsen-Hammill Test of Written Spelling (TWS)
3. A student rating scale developed by Rochelle Watts

It is hoped that a large number of Grade Five classes will participate in this study so that the predictive validity of the Jansky-de Hirsch tests can be determined for our district. Screening data is available for 1250 children who attended North Vancouver kindergartens in 1975-1976. The CTBS tests will be machine-scored by ERIBC in Vancouver and the spelling test and student rating scales will be marked by Rochelle and her assistants. The CTBS and TWS test results will be sent back to the teachers as soon as possible in the fall. Additional information will be sent out early in September. Please contact Rochelle if you have any questions concerning the follow-up study.

Because this study has some important implications for the District, I would appreciate your co-operation in this endeavor.

721 Chesterfield Avenue, North Vancouver, B.C. V7M 2M5 Telephone (604) 987-8141

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: Elementary Principals

FROM: Rochelle Watts

DATE: September 8, 1980

In the last week of August, Leo Marshall sent out a notice explaining the details of my five-year follow-up study of the Jansky-de Hirsch kindergarten screening program. Since the implementation of this battery in 1975, a large number of North Vancouver teachers have asked about the predictive validity of the Jansky-de Hirsch test. Several research studies were done on the original 1966 screening battery but little research has been completed on the revised 1972 battery. This five-year follow-up study should provide valuable information on the predictive effectiveness of North Vancouver's kindergarten assessment program.

On Friday, September 5th, Jim Bourdon and I met with John Anderson, the consulting statistician from the Educational Research Institute of British Columbia. Specific details of the Grade Five testing were discussed at that time and we decided to use a random sampling of approximately twenty percent of the September 1980 Grade Five population.

If you are willing to participate in this study, the assessment procedures would be as follows:

1. Approximately twenty percent of your Grade Five students would be randomly selected for inclusion in the follow-up study. Students not enrolled in a North Vancouver kindergarten program in 1975-1976 would be excluded before the random selection.
2. During the latter part of October, the LAC teacher would be asked to administer six subtests (V,R, and L) from the Canadian Tests of Basic Skills (Form 4M - Level 11). The Test of Written Spelling would be administered by the LAC teacher in the early part of November. Detailed information concerning this testing will be given to the LAC teachers at their September 25th in-service session.
3. During the early part of December, the Grade Five classroom teacher(s) would be asked to complete a one page student rating

scale for those students involved in the study. Student rating scales would not be required for the remainder of the Grade Five students.

If your Grade Five teachers are planning on using the CTBS as part of their fall screening assessment, it may be feasible to have all the Grade Five students tested at the same time, i.e., the learning assistance teacher could be testing the randomly selected students in the LAC or library while the remainder of the students are receiving the CTBS in their classroom.

Leo Marshall and I discussed the question of notification of parents as we felt that some parents may become concerned if their child is tested by the LAC teacher for no apparent reason. I will be writing a form letter to parents that you can use if you wish. If you are planning on participating in this study, please make sure you notify parents if their child is one of the randomly selected students in this study.

I would appreciate knowing as soon as possible if you are willing to participate in this follow-up study as the random selection of students will need to be done by late September or early October. The learning assistance teachers in participating schools will be asked to forward a list of all Grade Five students and their school placement in 1975-1976.

Thank you for considering involvement in this study.

Sincerely,

Rochelle Watts

Rochelle Watts
Learning Assistance Consultant

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: Elementary Learning Assistance Teachers

FROM: Rochelle Watts

DATE: October 1, 1980

Thank you for sending in the list of your Grade Five students. I know it's a very busy time for all of you and I appreciate all your comments re kindergarten placement. Needless to say, these detailed lists have saved me many hours of sorting through school permanent record cards.

As most of you know, I have received an ERIBC research grant for this follow-up study. This financial aid has enabled me to hire Ann Neuman and Margaret Ward (Brian's wife) to help me with the marking of the TWS subtests. Ann is also assisting me with the matching of the Jansky screening batteries and the Grade Five names you recently sent me. We hope to be finished the matching in the next few days.

Many schools have asked me to write a short letter to parents explaining the purpose of the Grade Five testing. I will be sending you one copy of this letter for each of your Grade Five randomly selected students. If you wish, you and/or your principal could write your own explanatory letter. Please make sure this letter is sent to parents on or near the 14th of October.

I would like to have the names of all students who have repeated a grade since their 1975-1976 kindergarten year in North Vancouver. This information is available on the permanent record cards. Please check the Grade Four P.R. cards and send me the name of any student who has repeated a grade if they attended a North Vancouver kindergarten in 1975-1976. Please submit a nil report if none of your Grade Four students have repeated any grade from kindergarten to the present time. I would like this information sent to me in the Tuesday, October 7th milkrun. Please let me know if you can't meet this deadline so I can come up and check your permanent record cards.

Thank you for your help with the above data.

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: ELEMENTARY LEARNING ASSISTANCE TEACHERS

FROM: ROCHELLE WATTS

DATE: October 11, 1980

Thank you for submitting the names of any Grade Four students who have repeated a grade. These pupils' names were included in the total list of 756 children whose Jansky-de Hirsch scores are available for the follow-up study.

Three hundred names were randomly selected from this list of 756 names. Since the random sampling was done by district, not by school, some schools have more than 20% of their Grade Five students and some schools have less than 20%. Please include any Grade Four students in the CTBS and TWS testing if their names are on the randomly selected list.

A parent information letter is included in this newsletter. Please contact Zina Louie if you need additional copies. This letter should be sent out to the parent/s before testing begins and the blank line should be completed with the parent/s name/s. Although most schools asked me to write the parent information letter, you and/or your principal may prefer to send out your own information form.

SPELLING TESTING: The list of spelling words and the blank answer forms will be sent to you in the Friday, October 24th milkrun.

CTBS TESTING: Six subtests of the CTBS are to be given: Vocabulary, Reading and the four Language subtests. Please give the Reading and Vocabulary subtests during the first session and the Language subtests during the second session. It is important that the time limits be strictly observed and directions for administration are given in the CTBS manual. The ITBS answer sheets included with this newsletter are the ones to be used for the follow-up study. Make sure each child writes his/her first and last name, the date and the name of his/her school on the answer sheet.

Please try to give the two CTBS sessions by the 31st of October. After you have finished administering the six subtests, send the answer sheets, CTBS manual and CTBS booklets to me at the Board Office.

Thank you for all your help with this follow-up study!

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

October 14, 1980

Dear ________________________________:

Each year in your school, the learning assistance teacher gives the kindergarten students an individual screening test called the Jansky-de Hirsch Screening Index. The results of this testing are given to the kindergarten teacher so that she can give extra help to children who may be having difficulty on one or more areas of the Jansky-de Hirsch battery.

In the next few weeks a number of students in each school will be participating in a five-year follow-up study of our kindergarten screening program. These children have been randomly selected from a list of all students who attended a North Vancouver kindergarten in 1975-1976. Your child has been randomly selected as one of the three hundred students who will take part in this study. The group testing will be administered by the learning assistance teacher and it will consist of two widely used reading and spelling tests.

Please contact your school's principal or learning assistance teacher if you have any questions about this testing. This follow-up study has been requested by many teachers and principals and it should provide us with valuable information on the predictive effectiveness of our kindergarten screening program.

Sincerely,

Rochelle Watts
Learning Assistance Consultant

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: Elementary Learning Assistance Teachers

FROM: Rochelle Watts

DATE: October 21, 1980

The Test of Written Spelling (TWS) answer sheets and dictation words are enclosed with this newsletter. Please make sure the students use the correct answer sheet. The TWS Predictable Words subtest has 35 words and the TWS Unpredictable Words subtest has 25 words. A short break should be scheduled between the two subtests if you are giving them at the same time. Please do not tell the students which subtest has phonetic words and which subtest has non-phonetic words.

I would appreciate receiving the TWS answer sheets in the Friday, November 7th milkrun. Ann Neuman and Margaret Ward (Brian's wife) will help me mark the two subtests. The results will be sent back to you as soon as possible.

Several classroom teachers have asked me why both the CTBS spelling subtest and the TWS subtests are being given to the students participating in the study. The Test of Written Spelling is an oral-dictation test and the CTBS spelling subtest is a multiple-choice test. We felt it was important to administer both kinds of instruments so that we can compare the results.

Don't forget to send in your CEC registration form if you plan to attend the provincial CEC Conference on November 6th to 8th. Please contact Marilla Baird at Carisbrooke (985-7484) if you need information or more registration forms for the conference.

The North Vancouver ACLD will be holding their next meeting on Wednesday, October 29th at 8:00 p.m. at the CSC. The guest speaker will be a UBC child psychiatrist, Dr. Joyce Connolly, and her topic will be "Prevention of Secondary Emotional Difficulties Related to Learning Disabilities." All interested teachers and parents are invited to attend.

Thank you for all the help you have given me during the past few weeks. This study could not be completed without your assistance.

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: Grade Five Teachers, Principals and LAC Teachers

FROM: Rochelle Watts

DATE: November 21, 1980

Thank you very much for all your co-operation on the Jansky-de Hirsch follow-up study. This month has been very busy for everyone and I appreciate your assistance with the CTBS and TWS testing. A one-page student rating scale will be sent out to classroom teachers next week and that will complete the first stage of the study.

The Canadian Tests of Basic Skills are currently being marked by the Educational Research Institute of B.C. and they should be sent back to me in the next few days.

The spelling scores from the Larsen-Hammill Test of Written Spelling are enclosed with this memo. Copies have been sent to the Grade Five classroom teachers, principal and LAC teacher in your school. Scores on the Unpredictable Words subtest (non-phonetic words) were generally lower than scores on the Predictable Words subtest (phonetic words).

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: Grade Five Teachers

FROM: Rochelle Watts

DATE: November 25, 1980

In the past few weeks, one or more of your students has been given the CTBS and TWS subtests as part of the five-year follow-up study of the Jansky-de Hirsch kindergarten battery. Although these normative scores are an essential part of the study, it is equally important to have teacher evaluation of each student's daily classroom progress. A Student Rating Scale (SRS) has been designed for this purpose and copies for your pupils are enclosed with this memo.

Please assess each student carefully as the results will be correlated with the kindergarten, CTBS and TWS data. Ratings should be based on your estimate of the student's progress compared to the average Grade Five student in North Vancouver. Your evaluation of an average Grade Five student is dependent on your own teaching experience in North Vancouver schools. In some schools the majority of students may be above the district average and the opposite may be the case in some other schools. Ratings should be primarily based on the student's daily classroom progress rather than on test results from one or two achievement tests. Each section should be completed and only one rating per section should be given.

Please read the enclosed definition sheet before beginning the SRS. If you have any questions about the terms and/or the ratings, feel free to contact me at the School Board Office.

Please try to complete these student rating scales during the first week of December. I would appreciate the forms being sent to me at the School Board Office by Tuesday, December 9th. Thank you for your assistance with this phase of the follow-up study.

NORTH VANCOUVER SCHOOL DISTRICT
School District No. 44 (North Vancouver)

TO: Elementary Learning Assistance Teachers

FROM: Rochelle Watts

DATE: June 9, 1981

Please find enclosed the two forms we discussed at our last workshop. These two forms will help me determine which of the students in the study have received school and/or district special education services.

The first form consists of five questions, the first three questions to be answered by the LAC teacher and the last two questions to be answered by the subjects' classroom teacher. Please complete the first three questions on district special education services to the best of your knowledge. I will be checking the special education files from 1976-1981 to see which students have received a psycho-educational assessment for reading and/or spelling difficulties. I already have the names of students who were given Orton-Gillingham tutoring or who attended the Diagnostic-Remediation Centre. The 3 questions you answer will provide a confirmation of this information.

Please sit down with your Grade Five teachers and have them complete the last two questions on this form. The student should be compared to the average Grade Five student in North Vancouver, not in your school. The classroom teacher's perception will naturally depend on his/her teaching experience in the district.

The second form will provide information on each subject's learning assistance background. Some of this data may be unavailable for the subjects, especially if there has been a change of LAC teachers in your school. If this information is not available from school records, previous classroom teachers and/or previous LAC teachers, please check the "don't know" column for the appropriate grade. The Grade Five LAC section should be filled out for each student.

Please send the completed questionnaires to me by Tuesday, June 23rd. I would appreciate it if you didn't fold the questionnaires and sent them to me in a 9" by 12" envelope. Thank you for your help with these forms.

APPENDIX B

Forms Used in the Study

GRADE FIVE STUDENT RATING SCALE - Definition of Terms

Reading Vocabulary

- understands the meaning of words in a reading passage

Word Analysis

- being able to sound out a new word; phonetic and structual analysis

Sight Word Recognition

- instant recognition of a word without having to sound the word out

Oral Reading

- correct phrasing, expression, etc. when oral reading a passage

Reading Comprehension

- understanding the meaning of a reading selection

Punctuation Skills

- ability to use correct punctuation in daily assignments

Capitalization Skills

- ability to use correct capitalization in daily assignments

Grammatical Usage

- ability to use correct grammatical structures in daily assignments, e.g., subject/verb agreement and correct use of homonyms

Spelling

- ability to use correct spelling in daily assignments

Oral Vocabulary

- the quality of the student's speaking vocabulary

Works Independently

- ability to work independently without seeking help from other people

Concentrates on Assigned Task

- ability to work on an assigned task without daydreaming and/or talking to other people

Listens to Directions

- ability to understand oral directions given by the teacher

Gets Along Socially with Peers

- ability to develop positive social relationships with peers

GRADE FIVE STUDENT RATING SCALE

Student ______________________________ Date __________________

Teacher ______________________________ School ________________

Please check the most appropriate column.

	much below average	below average	average	above average	much above average
Reading Vocabulary					
Word Analysis (decoding)					
Sight Word Recognition					
Oral Reading					
Reading Comprehension					
Punctuation Skills					
Capitalization Skills					
Grammatical Usage					
Spelling					
Oral Vocabulary					
Works Independently					
Concentrates on Assigned Task					
Listens to Directions					
Gets Along Socially with Peers					

NAME ______________ SCHOOL ______________ DATE ______________

	LAC Remediation			Size of Group		Frequency of LAC Remediation		
Grade One	yes	no	don't know	small group	individual remediation	more than 3x a week	3x a week	less than 3x a week
Grade Two	yes	no	don't know	small group	individual remediation	more than 3x a week	3x a week	less than 3x a week
Grade Three	yes	no	don't know	small group	individual remediation	more than 3x a week	3x a week	less than 3x a week
Grade Four	yes	no	don't know	small group	individual remediation	more than 3x a week	3x a week	less than 3x a week
Grade Five	yes	no	don't know	small group	individual remediation	more than 3x a week	3x a week	less than 3x a week

Student ______________________________ Date ______________

School ______________________________

LAC Teacher ___________________________

PLEASE CHECK THE APPROPRIATE LINE FOR EACH QUESTION.

---

1. Has this student ever had a psychoeducational assessment from a North Vancouver school psychologist?

   yes _____ no _____ don't know _____

---

2. Has this student ever received Orton-Gillingham tutoring from one or more North Vancouver volunteer tutors?

   yes _____ no _____ don't know _____

---

3. Has this student ever attended the Diagnostic-Remediation Centre (D.C.1) at North Star School?

   yes _____ no _____ don't know _____

---

4. Is this student experiencing difficulty with reading? (compared to the average North Vancouver Grade Five student)

   yes _____ no _____

---

5. Is this student experiencing difficulty with spelling? (compared to the average North Vancouver Grade Five student)

   yes _____ no _____

APPENDIX C

Instruments Used in the Study

The Jansky-de Hirsch Screening Index

Bender Motor Gestalt

This subtest consists of six designs from the Bender Visual Motor Gestalt Test. The student is given unlined paper and a pencil and s/he is asked to copy each design. Erasing is not allowed but the student may cross out a design and attempt it for a second time elsewhere on the page.

Gates Word Matching

Twelve items from the Gates Reading Readiness Battery were selected for this subtest. Each item consists of four words with two of the words being the same and the other two words being similar in configuration. The student is asked to draw a line between the two words which look exactly alike. The first exercise can be used as an example if the student needs clarification.

Letter Naming

This subtest consists of six capital letters (A, B, C, F, J, and K) each printed on an index card. The student is shown the letters one at a time and s/he is asked to name each letter.

Picture Naming

Twenty-two line drawings are presented during this subtest and the student is asked to name each picture as the examiner points to it. All illustrations represent some type of concrete noun. The pupil's first utterance is recorded and self-correcting is not permitted. A list of acceptable answers is provided for each picture and substitutions are not allowed. Although two to five acceptable responses are provided for some drawings, most of the items only allow for one possible answer.

Binet Sentence Memory

Seven sentences from Test Six of the Stanford-Binet Intelligence Scale were used for this subtest. The sentences are divided into three age-related sections: age 4 (three sentences), age 5 (two sentences) and age 7 (two sentences). The student is given a short practice session with two sentences and then s/he is asked to repeat each of the seven sentences exactly as spoken by the examiner.

The Jansky-de Hirsch Diagnostic Battery

(Part I - ten subtests)

Name Writing

Each pupil is asked to print his/her first name on a piece of unlined paper. Scoring is based on the number of letters printed correctly.

Nonsense Word Matching

This subtest consists of ten rows of words, each row is composed of a stimulus word followed by four to six words which are the same, or similar in configuration, to the stimulus word. The student is asked to draw a line through all the words in the row which look exactly like the stimulus word. Practice is given with the first row of words and then the child is directed to complete the following nine rows.

Roswell-Chall Auditory Blending

The student's ability to blend parts of words into whole words is tested in this subtest. Three examples are given (n-ose, t-op and s-i-t) and then the child is asked to blend the ten test words.

Boston Speech Sound Discrimination

This subtest consists of 12 pages of line drawings representing words which contrast phonemically (for example, pen-pin). Each page has six drawings with each picture being illustrated three times. A sample page is also provided. The pages are shown twice to the child and s/he is asked to point to two pictures on each page.

Tapped Patterns

A mallet and a cardboard shield are used in this subtest. The examiner uses the mallet to tap out a pattern of loud and soft sounds and then the student is asked to reproduce the same pattern with the mallet. A series of five patterns are presented.

Category Names

There are four items in this subtest, each consisting of three words. The three words are read to the pupil and the child is asked to name a category for the words. A list of acceptable categories is provided with each test item.

Oral Language

This subtest consists of two cartoon sequences, each composed of four pictures. The cartoon sequences are shown one at a time to the student and the child is asked to tell the story in his/her own words. Scoring for the two stories is based on the pupil's syntactical maturity, articulation and ability to organize the material.

Word Recognition

This subtest checks the student's short-term sight word memory. The words "boy" and "train" are printed on index cards and the child is given a lesson with the words before Test One and a review after Test Five. These two words, together with eight other words printed on index cards, are arranged on the table and the child is asked to find the two test words.

Spelling of Two Words Previously Taught

In this subtest the student is asked to print the words "boy" and "train" after being given a brief look at both words. Points are given for the number of letters spelled correctly in each word.

Pencil Use

There are no specific test items for this section. The student's ability to use a pencil is observed in Tests One, Two and Nine and the examiner rates the child's pencil facility on a three-point scale.

The Canadian Tests of Basic Skills
(Form 4M, Level 11 - Six Subtests)

Vocabulary

This subtest consists of 43 test items to be completed in a maximum of 17 minutes. A stimulus word is given and the student must decide which of the four answers is closest in meaning to the stimulus word.

Reading Comprehension

Nine reading selections and 74 questions are presented in this subtest and the maximum time allowed is 55 minutes. The student is asked to select the best of four answers for each question. The authors (1974) classified the CTBS reading skills under four headings: details, purpose, organization and evaluation. Emphasis was placed on questions which assessed reading for meaning, for example, drawing inferences, developing generalizations and recognizing the main idea of a selection.

Spelling

This subtest uses a multiple-choice format to assess spelling competency. Forty-three test items are presented, each item consisting of four words, one of which may be misspelled. The student is asked to identify the incorrectly spelled word and a fifth response, "No mistake," is to be checked if the four words are spelled correctly. A time limit of 12 minutes is permitted for this subtest.

Capitalization

The 40 test items in this section use a multiple-choice format to assess knowledge of capitalization rules. The maximum time limit allowed for this subtest is 15 minutes. Each item consists of one long sentence or two short sentences printed on three lines. The student must determine if one of the three lines has a mistake in capitalization and, if not, the fourth line, "No mistakes," is to be checked.

Punctuation

The format of this subtest is very similar to the capitalization section. The 40 multiple-choice test items assess knowledge of punctuation rules. A maximum time limit of 20 minutes is permitted for this subtest. Each item consists of one long sentence or two short sentences printed on three lines. The student must decide if one of the three lines has a mistake in punctuation and, if not, the fourth line, "No mistakes," is to be checked.

Usage

This subtest assesses the knowledge and use of appropriate word and grammatical constructions. Thirty-four test items are presented in a multiple-choice format and a time limit of 20 minutes is allowed for this section. Each item consists of three short sentences, each sentence being printed on one line. The student is asked to identify the sentence which has a mistake in usage. If all the sentences are correct, the fourth line, "No mistakes," is to be checked.

APPENDIX D

Statistical Tables

Table A

Number and Percentage of Subjects Receiving
Learning Assistance Remediation in Grades One to Five

Grade	Yes	No	Unknown
Grade One (n = 285)*	28 (09.82%)	257 (90.18%)	19
Grade Two (n = 286)*	47 (16.43%)	239 (83.57%)	18
Grade Three (n = 298)*	54 (18.12%)	244 (81.88%)	06
Grade Four (n = 301)*	48 (15.95%)	253 (84.05%)	03
Grade Five (n = 304)	31 (10.20%)	273 (89.80%)	00

* Missing learning assistance data excluded from number in each grade.

Table B

Number and Percentage of Male and Female Subjects
Receiving Learning Assistance Remediation in Grades One to Five

Grade	Male Subjects	Female Subjects
Grade One (n = 28)	21 (75.00%)	7 (25.00%)
Grade Two (n = 47)	35 (74.47%)	12 (25.53%)
Grade Three (n = 54)	37 (68.52%)	17 (31.48%)
Grade Four (n = 48)	36 (75.00%)	12 (25.00%)
Grade Five (n = 31)	28 (90.32%	03 (09.68%)

Table C

Number and Percentage of Learning Assistance Subjects Receiving Individual and/or Small Group Instruction in Grades One to Five

	Remedial Instruction		
Grade	Individual	Small Group	Small Group & Individual
Grade One (n = 28)	8 (28.57%)	17 (60.71%)	3 (10.71%)
Grade Two (n = 47)	12 (25.53%)	31 (65.96%)	4 (08.51%)
Grade Three (n = 54)	6 (11.11%)	45 (83.33%)	3 (05.56%)
Grade Four (n = 48)	11 (22.92%)	34 (70.83%)	3 (06.25%)
Grade Five (n = 31)	10 (32.26%)	18 (58.06%)	3 (09.68%)

Table D

Weekly Frequency of Remedial Instruction for Subjects Receiving Learning Assistance in Grades One to Five

Grade	Frequency of Remedial Instruction More Than 3x a Week	3x a Week	Less Than 3x a Week
Grade One (n = 28)	20 (71.43%)	3 (10.71%)	5 (17.86%)
Grade Two (n = 47)	31 (65.96%)	14 (29.79%)	2 (04.26%)
Grade Three (n = 54)	31 (57.41 %)	12 (22.22%)	11 (20.37%)
Grade Four (n = 48)	30 (62.50%)	12 (25.00%)	6 (12.50%)
Grade Five (n = 31)	18 (58.06%)	8 (25.81%)	5 (16.13%)

Table E

Number and Percentage of 304 Subjects
Receiving North Vancouver District Special Education Services

Service	Yes	No
Psychoeducational Assessment	19 (06.25%)	285 (93.75%)
Orton-Gillingham Tutoring	05 (01.64%)	299 (98.36%)
Diagnostic-Remediation Centre	08 (02.63%)	296 (97.37%)

Table F

Janksy-de Hirsch Screening Index Profiles (raw scores) for the 19 Subjects Receiving Psychoeducational Assessments

Subject Number			Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory
58	OGT	DRC	6	3	1	15	2
67	-	DRC	4	9	2	18	2
68	-	-	5	4	5	16	2
81	OGT	-	4	4	6	18	2
98	-	-	6	10	6	17	2
110	-	-	2	4	6	10	1
147	OGT	DRC	5	6	1	18	1
158	-	DRC	5	5	3	13	2
161*	-	-	3	11	1	6	0
173	-	-	6	10	6	16	3
182	OGT	DRC	5	8	0	16	2
188	-	-	4	11	6	14	2
195	-	-	5	8	6	15	2
200	-	-	6	6	5	16	2
206	-	-	1	5	6	15	2
278	-	DRC	3	9	5	13	2
283	-	DRC	5	8	5	16	1
290	OGT	DRC	5	7	6	12	2
300	-	-	2	5	1	11	2

* female
OGT - Orton-Gillingham Tutoring
DRC - Diagnostic-Remediation Centre

Table G

Jansky-de Hirsch Screening Index Profiles (converted scores) for the 19 Subjects Receiving Psychoeducational Assessments

Subject Number			Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory	Index Score
58	OGT	DRC	15	1	5	16	10	47
67	-	DRC	7	8	8	20	10	53
68	-	-	11	1	14	18	10	54
81	OGT	-	7	1	19	20	10	57
98	-	-	15	10	19	19	10	73
110	-	-	3	1	19	9	5	37
147	OGT	DRC	11	4	5	20	5	45
158	-	DRC	11	2	10	13	10	46
161*	-	-	4	11	4	3	0	22
173	-	-	15	10	19	18	15	77
182	OGT	DRC	11	7	0	18	10	46
188	-	-	7	12	19	15	10	63
195	-	-	11	7	19	16	10	63
200	-	-	15	4	14	18	10	61
206	-	-	1	2	19	16	10	48
278	-	DRC	5	8	14	13	10	50
283	-	DRC	11	7	14	18	5	55
290	OGT	DRC	11	5	19	12	10	57
300	-	-	3	2	5	11	10	31

* female

OGT - Orton-Gillingham tutoring

DRC - Diagnostic-Remediation Centre

Table H

Jansky-de Hirsch Screening Index Means for Subjects Receiving North Vancouver Special Education Services (raw score variables)

Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory
District Services					
Orton-Gillingham Tutoring (n = 5)	5.00	5.60	2.80	15.80	1.80
Diagnostic-Remediation Centre (n = 8)	4.75	6.88	2.88	15.13	1.75
Psycho-educational Assessment (n = 19)	4.32	7.00	4.05	14.47	1.79
Group Comparison Means					
Male Subjects (n = 155)	5.20	7.37	5.00	15.46	2.00
Female Subjects (n = 149)	5.26	8.07	5.27	14.23	2.07
Total Subjects (n = 304)	5.23	7.71	5.13	14.86	2.03

Table I

Jansky-de Hirsch Screening Index Means
for Subjects Receiving North Vancouver Special Education Services
(converted score variables)

Variable	Bender-Gestalt	Word Matching	Letter Naming	Picture Naming	Sentence Memory	Index Score
District Services						
Orton-Gillingham Tutoring (n = 5)	11.00	3.60	9.60	17.20	9.00	50.40
Diagnostic-Remediation Centre (n = 8)	10.25	5.25	9.38	16.25	8.75	49.88
Psycho-educational Assessment (n = 19)	9.16	5.42	12.89	15.42	8.95	51.84
Group Comparison Means						
Male Subjects (n = 155)	11.98	6.06	15.51	16.80	10.00	60.35
Female Subjects (n = 149)	11.37	6.67	15.58	13.97	9.49	57.07
Total Subjects (n = 304)	11.68	6.36	15.54	15.41	9.75	58.74

Table J

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Canadian Tests of Basic Skills Vocabulary Subtest

Variable	R Square	F	Beta
Raw Scores			
Picture Naming	0.130	45.116	0.725
Sex of Student	0.207	39.242	-3.248
Word Matching	0.254	33.965	0.536
Sentence Memory	0.298	31.608	2.604
Letter Naming	0.321	28.081	0.833
Bender-Gestalt	0.340	25.444	1.250
		(Constant)	-5.841
Converted Scores			
Letter Naming	0.122	41.824	0.317
Word Matching	0.195	36.366	0.388
Sentence Memory	0.254	33.926	0.529
Sex of Student	0.287	26.241	-4.974
Picture Naming	0.329	29.182	0.546
Bender-Gestalt	0.347	26.241	0.355
		(Constant)	-3.316

Table K

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Canadian Tests of Basic Skills Comprehension Subtest

Variable	R Square	F	Beta
Raw Scores			
Letter Naming	0.135	46.813	1.402
Word Matching	0.214	40.874	0.755
Sex of Student	0.267	36.296	-7.266
Picture Naming	0.331	36.823	1.000
Bender-Gestalt	0.357	32.945	2.049
Sentence Memory	0.377	29.811	2.913
		(Constant)	1.967
Converted Scores			
Letter Naming	0.122	41.643	0.479
Sex of Student	0.204	38.425	-9.671
Picture Naming	0.300	42.808	0.779
Bender-Gestalt	0.336	37.763	0.588
Word Matching	0.358	33.078	0.531
Sentence Memory	0.377	29.915	0.593
		(Constant)	6.349

Table L

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Canadian Tests of Basic Skills Spelling Subtest

Variable	R Square	F	Beta
Raw Scores			
Letter Naming	0.124	42.464	1.230
Sex of Student	0.187	34.593	-4.311
Bender-Gestalt	0.246	32.474	1.699
Word Matching	0.274	28.066	0.518
Sentence Memory	0.283	23.467	1.132
Picture Naming	0.285	19.702	0.185
		(Constant)	0.583
Converted Scores			
Letter Naming	0.120	41.003	0.437
Sex of Student	0.198	37.003	-5.487
Bender-Gestalt	0.257	34.529	0.498
Word Matching	0.286	29.908	0.390
Sentence Memory	0.295	24.876	0.223
Picture Naming	0.297	20.879	0.138
		(Constant)	2.652

Table M

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Canadian Tests of Basic Skills Capitalization Subtest

Variable	R Square	F	Beta
Raw Scores			
Word Matching	0.104	34.773	0.486
Sex of Student	0.163	29.229	-4.140
Picture Naming	0.206	25.808	0.439
Bender-Gestalt	0.221	21.151	0.867
Letter Naming	0.232	17.988	0.504
Sentence Memory	0.235	15.132	0.572
		(Constant)	3.927
Converted Scores			
Word Matching	0.099	33.127	0.374
Sex of Student	0.166	29.859	-5.067
Picture Naming	0.210	26.478	0.338
Bender-Gestalt	0.225	21.596	0.177
Letter Naming	0.234	18.143	0.215
Sentence Memory	0.236	15.236	0.110
		(Constant)	6.599

Table N

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Canadian Tests of Basic Skills Punctuation Subtest

Variable	R Square	F	Beta
Raw Scores			
Word Matching	0.145	51.177	0.677
Sex of Student	0.221	42.644	-4.669
Picture Naming	0.255	34.092	0.336
Bender-Gestalt	0.277	28.537	1.102
Letter Naming	0.289	24.103	0.517
Sentence Memory	0.296	20.750	1.089
		(Constant)	1.327
Converted Scores			
Word Matching	0.137	47.961	0.496
Sex of Student	0.223	43.169	-5.729
Picture Naming	0.260	35.013	0.263
Bender-Gestalt	0.280	29.030	0.311
Letter Naming	0.297	25.053	0.203
Sentence Memory	0.303	21.466	0.212
		(Constant)	3.690

Table O

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Canadian Tests of Basic Skills Usage Subtest

Variable	R Square	F	Beta
Raw Scores			
Sex of Student	0.109	36.772	-3.585
Sentence Memory	0.204	38.419	1.728
Letter Naming	0.261	35.246	0.621
Word Matching	0.297	31.421	0.308
Bender-Gestalt	0.316	27.406	0.772
Picture Naming	0.324	23.614	0.234
		(Constant)	3.176
Converted Scores			
Sex of Student	0.109	36.772	-4.514
Letter Naming	0.206	38.996	0.216
Sentence Memory	0.265	35.998	0.354
Word Matching	0.305	32.679	0.241
Bender-Gestalt	0.321	28.116	0.208
Picture Naming	0.330	24.351	0.187
		(Constant)	4.184

Table P

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Test of Written Spelling Predictable Words Subtest

Variable	R Square	F	Beta
Raw Scores			
Letter Naming	0.144	50.698	0.850
Sex of Student	0.210	39.826	-2.161
Bender-Gestalt	0.249	33.099	0.818
Sentence Memory	0.262	26.438	0.835
Word Matching	0.269	21.911	0.172
Picture Naming	0.270	18.276	-0.611
		(Constant)	19.627
Converted Scores			
Letter Naming	0.136	47.201	0.290
Sex of Student	0.217	41.543	-2.715
Bender-Gestalt	0.255	34.176	0.235
Sentence Memory	0.267	27.195	0.168
Word Matching	0.275	22.571	0.125
Picture Naming	0.276	18.797	-0.366
		(Constant)	19.986

Table Q

Multiple Regression Analysis of Screening Index Subtests and
Sex of Student to Test of Written Spelling Unpredictable Words Subtest

Variable	R Square	F	Beta
Raw Scores			
Letter Naming	0.131	45.180	0.870
Sex of Student	0.224	43.208	-3.301
Bender-Gestalt	0.273	37.503	1.051
Word Matching	0.293	30.896	0.293
Sentence Memory	0.305	26.079	0.937
Picture Naming	0.305	21.674	0.310
		(Constant)	1.741
Converted Scores			
Letter Naming	0.125	43.085	0.312
Sex of Student	0.236	46.275	-4.006
Bender-Gestalt	0.284	39.460	0.300
Word Matching	0.304	32.481	0.216
Sentence Memory	0.314	27.236	0.184
Picture Naming	0.315	22.633	0.213
		(Constant)	2.761

Table R

Multiple Regression Analysis of Screening Index Subtests and Sex of Student to Test of Written Spelling Total Score Variable

Variable	R Square	F	Beta
Raw Scores			
Letter Naming	0.149	52.541	1.720
Sex of Student	0.236	46.297	-5.462
Bender-Gestalt	0.285	39.692	1.869
Word Matching	0.300	32.000	0.465
Sentence Memory	0.313	27.075	1.771
Picture Naming	0.313	22.491	-0.301
		(Constant)	21.368
Converted Scores			
Letter Naming	0.141	49.518	0.600
Sex of Student	0.247	49.112	-6.763
Bender-Gestalt	0.294	41.503	0.533
Word Matching	0.310	33.450	0.339
Sentence Memory	0.322	28.163	0.348
		(Constant)	22.635

Table S

Principal Components Factor Analysis of the Criterion Test Variables (without iterations)

Variable	Factor Analysis
CTBS Subtests	
Vocabulary	0.83177
Comprehension	0.85109
Spelling	0.87188
Capitalization	0.79428
Punctuation	0.84383
Usage	0.80477
TWS Subtests	
Predictable Words	0.83249
Unpredictable Words	0.88060